THE FOUNDRY

VOL. 15. DETROIT, MICH., DECEMBER, 1899. No. 88.

A German Brass Furnace.

Through the courtesy of Robert Wagner, of Schonau, near Chemnitz, Germany, we are enabled to present our readers with an illustrated description of a brass furnace, which in construction and operation differs radically from any that have so far come under our notice.

When we speak of brass furnaces on this side of the Atlantic, the mind instantly reverts to the familiar hole in the floor, where one or more furnaces are ranged alongside of each other, each one being occupied by its own particular crucible, which in capacity is generally limited to what two men will handle with ease. When a large casting is to be poured a sufficient number of crucibles are employed or the metal is melted in the cupola. For the smaller castings the metal is poured directly from the crucible in which it is melted.

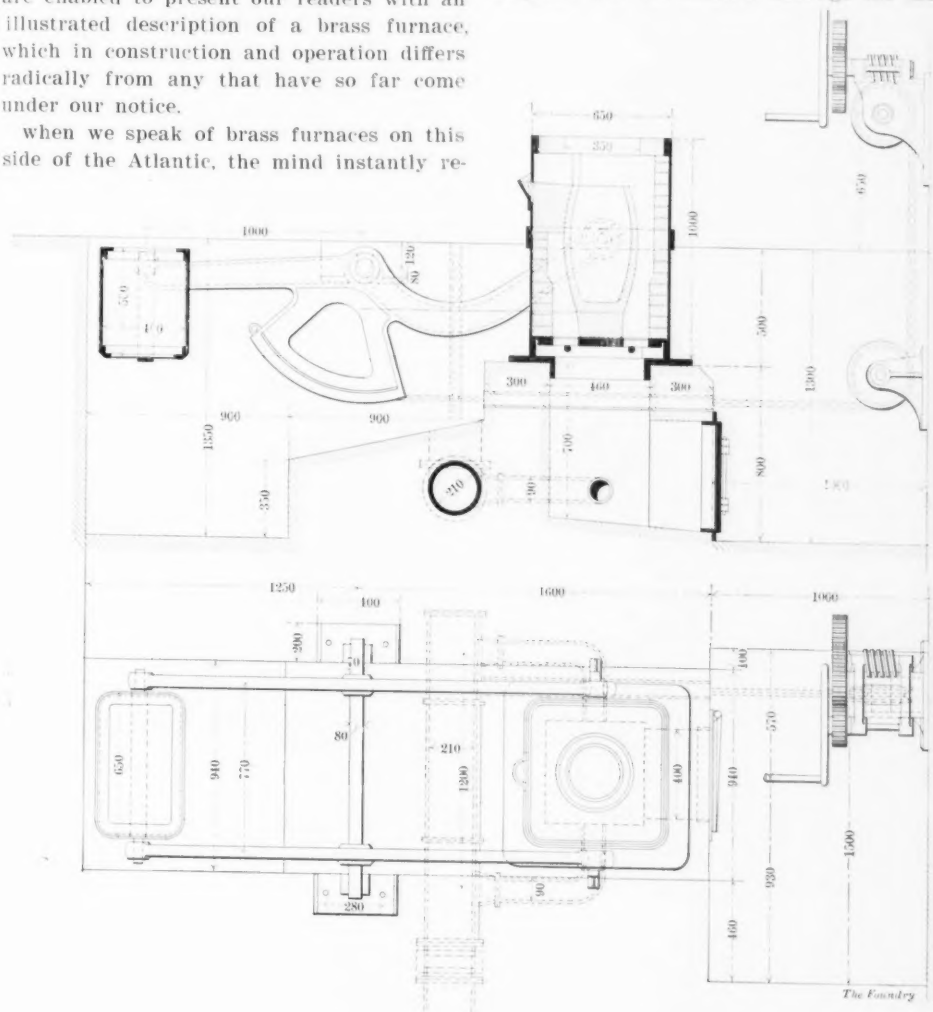


FIG. 1.

Mr. Wagner's furnace, of which the plan and a sectional view is shown in Fig. 1, the measurements being represented by the

metrical system, differs from the ordinary furnace in that the metal is melted in one large crucible and afterwards distributed to smaller ones from which it is poured into the molds. The furnace shown holds a crucible having a capacity of six hundred pounds. A glance at Fig. 2 shows the general appearance of that corner of the shop where the furnace is located. By reverting to Fig. 1 it will be seen that the melting crucible is held securely in a casing lined with fire brick, the whole thing being mounted on a balanced lever whose movements are controlled by the worm-geared hoisting drum shown to the right in Figs. 1, 2 and 3. When it is desired to empty the melting crucible the furnace is elevated through the medium of this chain hoist, which is easily operated by one man, to the position occupied in Fig. 3, a lever being afterwards attached to one of the trunnions as shown, by which it may be tilted to any desired position and the metal emptied into the smaller crucible, appearing in the illustration in the right position to receive the metal.

It will be seen that by this arrangement the melting crucible remains stationary in the furnace at all times. A further examination of Figs. 1, 2 and 3 shows that the pouring spout of the furnace is located some distance from its extreme end on a line even with the top of the melting crucible. This is clearly apparent in Figs. 2 and 3, and may be better judged from the position of the smaller crucible.

These furnaces are operated with a forced draft, the blast being admitted through the pipe shown to the left of furnace in Figs. 2 and 3 and also indicated in Fig. 1.

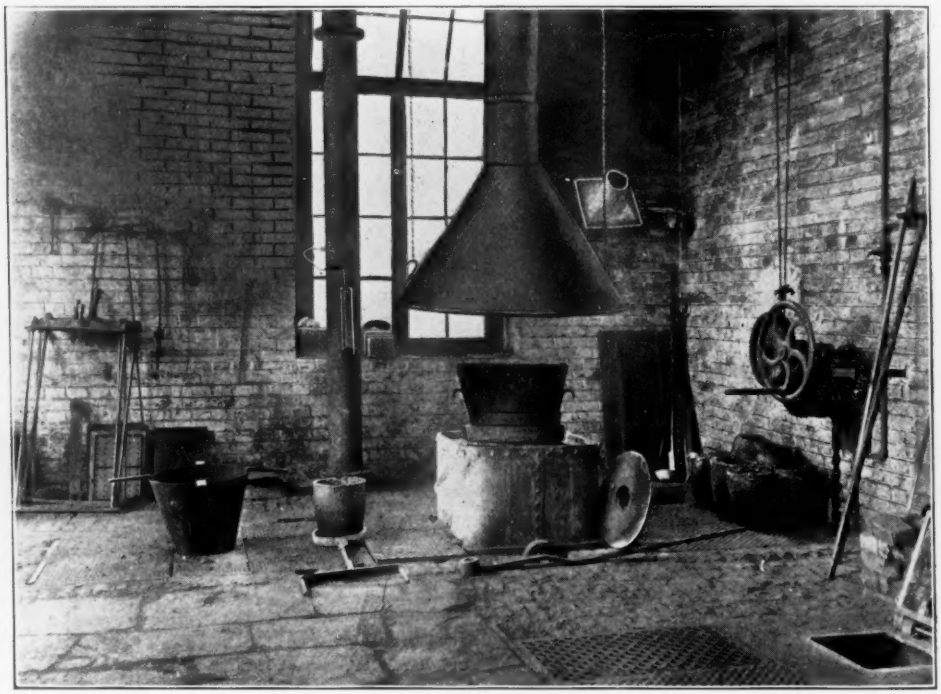


FIG. 2.

It is ten inches in diameter and supplies two branch pipes which enter the fireplace at opposite sides. In general use the blast has a pressure equal to six or seven inches of water column.

The hopper seen on top of furnace in Fig. 2 is to facilitate the introduction of the metal into the melting crucible. It will be noted that there is no chimney to these furnaces, the waste gases passing off through the hood seen directly over the furnace in Figs. 2, 3 and 4, the latter illustration furnishing a clear view of the pipe attached to the hood for an outlet. The other pipe

seen in this figure is the blast pipe. By this method of construction all the heat generated below the furnace must pass over the top of the crucible. When the six hundred pounds of metal have been charged and melted, a gate in the blast pipe shuts off the wind, the hopper is removed with the help of a couple of bars fitting into the hooks seen on the side of same. To keep the heat in the furnace the cover seen to the right of this, in Fig. 2, is placed on the top of same, as shown in Fig. 3, as soon as the charging hopper is removed, when the furnace is ready to be moved into the emptying position it occupies in the illustration by the hand wheel and hoisting arrangement previously described.

FIG. 3.

The small crucibles shown hold about a hundred pounds each, and where extra hot metal is desired, they are heated just previous to being used. After all the metal has been emptied from the melting crucible some coke is supplied to the fire, the furnace is returned to the position it occupies in Fig. 2, the hopper is replaced and charging begins for the next heat.

Mr. Wagner writes that he takes from six to ten heats a day from this furnace, thus melting from 3,600 to 6,000 pounds of metal per day. About two hundred pounds of coke is consumed at each melting. The speed of melting is regulated by the amount of air forced through the furnace. With an air pressure of four ounces the six hundred pounds of metal, in this case brass for steam fittings and the like, can be melted in two hours. With six ounces of blast pressure the time is shortened to an hour and a half, while with eight ounces of pressure but fifty minutes are required. With one heat a day the fuel consumption is equal to 36 per cent of metal melted, while with ten heats in a day of ten hours this is reduced to 20.25 per cent, thus showing quite a gain in fuel through constant operation under a higher pressure of blast. When we consider the amount of fuel consumed in ordinary brass furnaces the last figures certainly make a good showing; in fact, some foundries consume more than this percentage of fuel in melting iron in their cupolas.

While it is of course true that the driving of a furnace in this rapid way will wear out crucibles faster than the slow-going natural draft, account must also be taken of the fact that in Mr. Wagner's method the melting

crucible is not subjected to the violent fluctuations of temperature to which we submit the ordinary crucible. Neither is it gripped by tongs, yanked and twisted around like our smaller crucibles. It stays in the furnace supported by a solid foundation, and receives practically a constant heat throughout the day. When we consider all of these things it is but reasonable to conclude that the wear and tear on this one six-hundred-pound crucible, and the cost of keeping it in repair, is far less than would be the cost of melting the same amount of metal in six one-hundred-pound crucibles. While smaller crucibles are used for pouring in this instance, yet it can not be said that this adds very much to the cost of the plan, because a crucible is not worn out in simply taking the place of a ladle like it would be if it had to perform the actual melting together with the rough handling attached to this.

Fig. 4 shows a portion of Mr. Wagner's brass foundry. The old battery of furnaces are visible to the right, the large furnace being shown in the extreme background, where one of the helpers is seen in the act of tilting it preparatory to emptying its contents. A small portion of the core oven is seen on the right, and although Mr. Wagner does not say anything about this, except that it uses coke as a fuel, yet we are inclined to think it is either a Millett oven with independent shelves or one built upon the same principles. We say so because we believe that a man who will show as much ingenuity as Mr. Wagner has in building this brass furnace, will not neglect to provide himself with suitable means for rapidly drying the great amount of small cores consumed in making such castings as steam fittings.

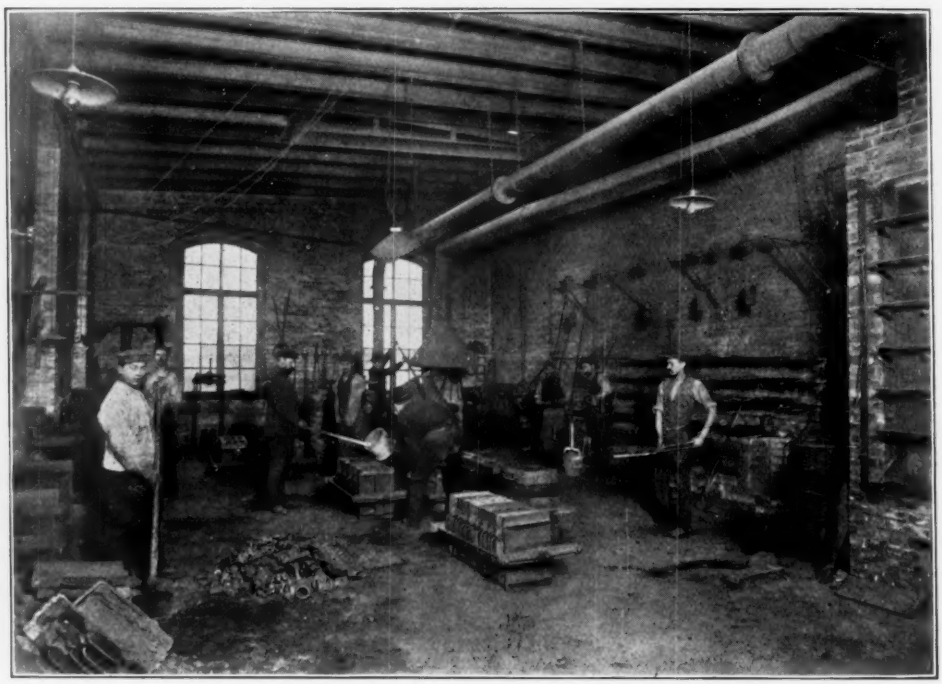


FIG. 4.

Fig. 5 presents another view of the molding room, the left hand side showing the benches. It is possible that we are wrong, but until we are sure such is the case, we are inclined to think that the tub system in common use throughout this country for brass molding is superior to the tables shown in the illustration. A molding bench or a tub should be so arranged as to keep the surplus sand out of the molder's way. Perhaps the tables shown are so made as to let this sand return to the heap underneath the benches, in which case our objection is void. However, the picture gives the impression that these benches are solid tables and what ap-

FIG. 5.

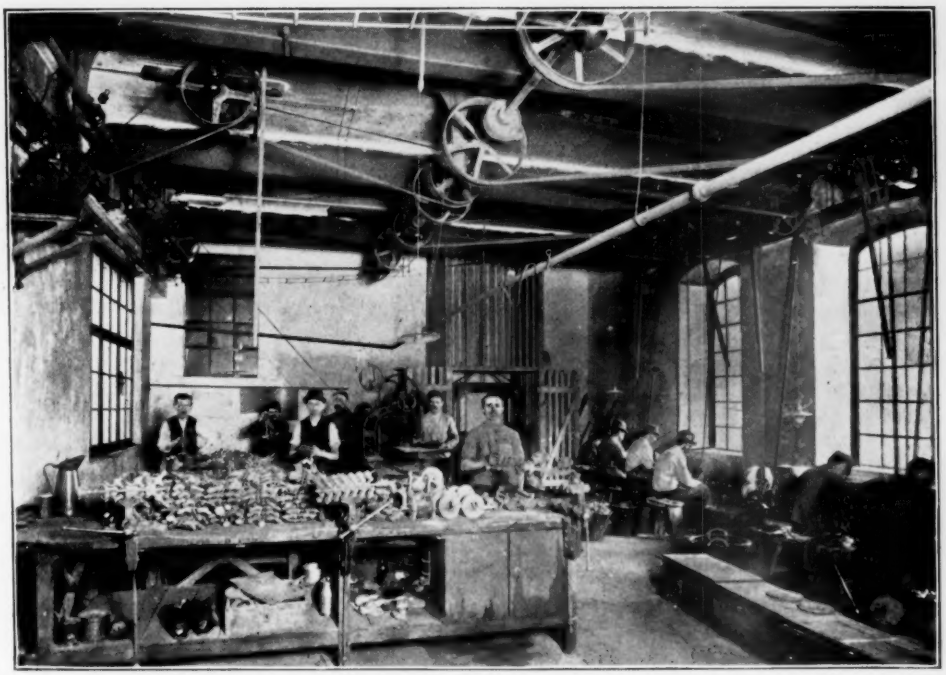


FIG. 6.

pears to be a locker under one of the benches strengthens us in this belief. While a locker is a nice thing to have, yet we are inclined to think the average bench molder on this side would rather have a bench that would keep itself clean automatically.

Turning from this part of the shop our eye lands on another familiar object, a Tabor molding machine. Mr. Wagner spent some time in this country and evidently ran across some things that impressed him favorably. The pipes seen overhead in this illustration carry air compressed to a pressure of about fifteen pounds per square inch. Mr. Wagner writes us that he will not buy any more bellows for the molders' use, but instead will supply each with a rubber hose and hand valve with which to clean his mold. On the right hand side of this illustration, Fig. 5 is seen the sand sifter, in the background appears the blower for supplying the furnace with air.

Fig. 6 shows the cleaning room, the band saw seen being used to remove the castings from the gates. The elevator in the rear transfers the castings directly to the storeroom. The emery and polishing wheels take up the right hand portion of this illustration.

Looking at these illustrations, the reader can not fail to observe the thoroughness with which every detail is attended. This is characteristic of the Germans, and it is a national trait that many of us would do well to imitate. From the blast gauge seen on the wind pipe in Figs. 2 and 3, clear down to the cleaning room in Fig. 6, there is a neatness about this shop that stamps it is being above the average. There are but few people in this hustling-bustling land who would go to the expense of putting a gauge on a blast pipe for a brass furnace, yet it has paid Mr. Wagner to do so, as his own statement of melting will show.

This is but one small feature a hurried glance at these illustrations reveals. How many American foundrymen would think it a paying proposition to furnish their molders with a piece of rubber hose for cleaning their molds? We have some nice foundries in this country, but after we say all the nice things we can about ourselves, the fact is bound to come back to us with greater force, that we can improve our methods of working in a great many directions. Nothing will bring out individual shortcomings like an interchange of ideas, and if we had more illustrated articles on practical shop affairs like the one Mr. Wagner has furnished us, we would soon find that we had not by any means reached our highest standard.

Mr. Wagner writes us that he melts two kinds of metal, yellow brass and brass suitable for valves, injectors and steam fittings. The latter he cast with the molds raised a few inches at the gate-end, just as is done here, while molds intended for yellow brass are cast on end as shown in Fig. 4, from eight to ten flasks being clamped together at one time, all molds for yellow brass being dried.

While in this country Mr. Wagner observed that our shops did not dry molds intended for yellow brass, and when he returned to Germany he tried to cast that metal in green sand, but found that the castings came out too rough. He writes us that he would like to have some practical foundryman from this side tell him how the trick is done. In view of the fact that Mr. Wagner has given us an interesting account of his foundry and his methods, we will ask our readers to step forward with an article or two on this subject. A fair exchange robs no one.

The Casting of Plates.

By R. H. PALMER.

In casting plates one is seldom troubled with coldshuts if the casting is an inch or more in thickness and due precautions are taken to have the iron fairly hot and the gates large enough to rapidly fill the mold. There is one instance when even these provisions will not always guard against a coldshut casting, and this happens when too strong a facing is used. A molder should always go slow in the use of seacoal when molding plates of any description. Even if no coldshut occurs on the main part of the casting itself, a more or less rounded corner will testify to the effect that the limit of seacoal has been passed.

All plates show a chronic tendency to warp and to further puzzle the foundryman. The same casting may warp one way from one mold and a similar casting, poured, may be, from the same ladle, will warp in an opposite direction. Some of these conundrums are not due to the eccentricity of the metal, but rather to the method of molding.

Where a pattern is used, the molder is very apt in rolling over the drag to have the same rest unevenly upon the floor. With wide flasks the bottom boards may rest ever so solid upon each side, while the center will not have a solid bearing. The result is that the sand follows the sagging center of the bottom board, the casting will show a gradually increasing thickness at the same part, and as uneven shrinkage is produced by uneven thickness, or distribution of metal, we have here one of the conditions which makes a crooked casting.

Instead of trying to make a level bed for the whole bottom board, I think it is far better to simply provide an ample bearing for the center of same, as at A, Figs. 1 and 2, and after the drag is deposited on this to wedge up the sides until the whole has a firm bearing. There is no doubt but that a truer plate can be obtained by bedding in than by rolling over, and doubtless the only reason why the former method is not practiced more is on account of a lack of ability, on the part of the general run of molders, in this feature of the trade.

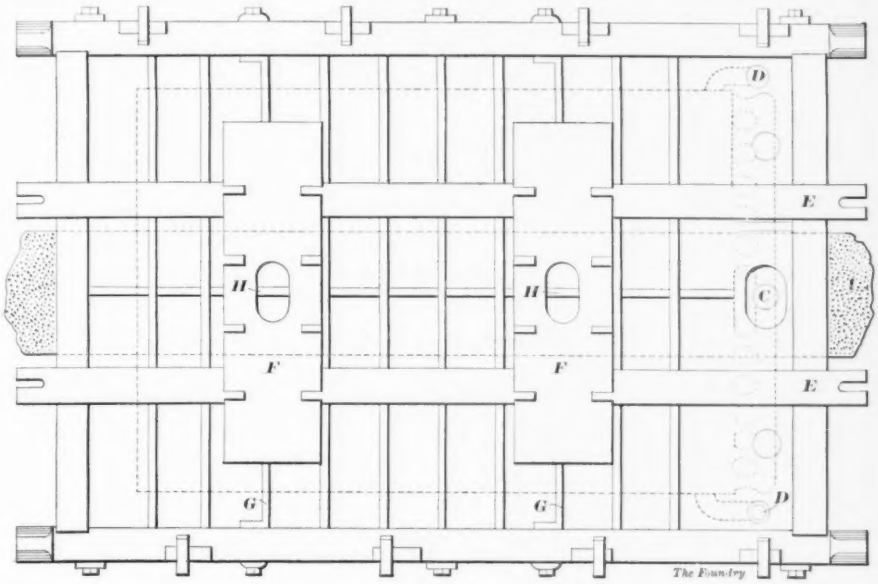


Fig. 1

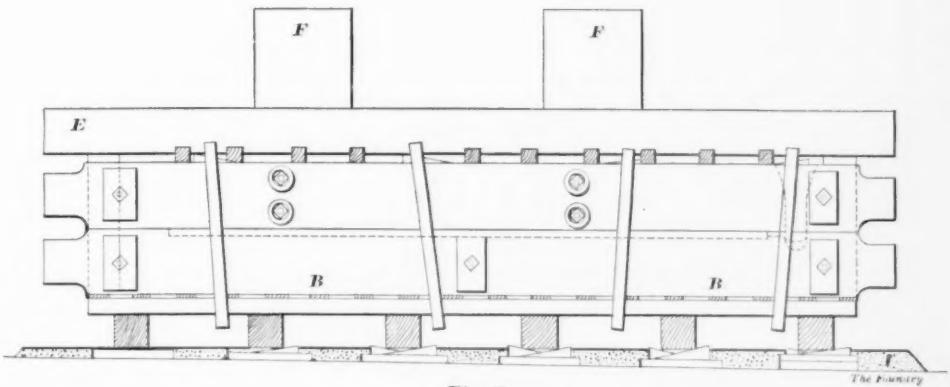


Fig. 2

With plates below an inch in thickness, coldshuts often appear on the cope side of the casting. My way of overcoming this is to raise the mold slightly at one end as shown in Fig. 2, which tends to keep the metal moving, the plate being poured from

one end altogether. This has a tendency to fill the mold gradually instead of suddenly, as occurs when the mold is poured in a perfectly level condition. When bedding in plates of considerable size, my method is to level up the bottom board as shown in Fig. 2, and to insert some thin blocks between the drag and bottom board as at B. The openings, which these blocks leave, serve as an outlet for the gases generated in the mold during pouring. A bed of cinders may be distributed next to the bottom board or a long wire may be inserted through the openings around the bottom board, a large number of horizontal outlets thus connecting the vertical vents made from above. An open sand is always to be preferred for this class of work.

The trick in bedding in plates, lays in not ramming the mold too hard. The lower part may be medium solid, but the two inches next to the bottom of the pattern should be carefully made. The best way is to level off this portion about a quarter of an inch higher than wanted with loose sand, and then ram it down just that distance with the help of a straightedge, see-sawing from one side to another. When the pattern is placed on a bed thus prepared, some weights should be evenly distributed on same to prevent it from being lifted away while the joint is being made. It is needless to say that the joint of flasks used as a guide in making such beds for the pattern should be in good condition and perfectly straight. Where cleats are placed on patterns, ample gutters should be made in the mold to receive these. Such excavations are easily filled in afterwards.

When the drag portion of a flask has a perfect joint, a bed may easily be made at any desired depth by having the straightedge notched to fit this distance. In gating, I prefer to cut these the full width of one end of the casting, having a main pouring gate, C, and risers placed as at D. I have tried this method on plates being 7 feet long and 5 feet wide and ranging in thickness from ⅝ of an inch upwards, and always obtained the best results. To prevent the straining of large plates during casting the binders, E, should be placed as in Fig. 1, as also the weights, F. When this has been done the clamps may be tightened, not before, and a wedge shoved firmly between the binders and each bar.

In order not to subject the mold to a greater strain than is necessary it is well to have someone watch the riser D, and with the mold slightly inclined, as shown, it is safe to stop pouring as soon as the iron appears in same. The illustration shows two of the bars, G, made of iron. While these make the flask slightly heavier to handle they also stiffen it and make it last enough longer to more than pay for their adoption.

In making such weights as F, they should be notched, as shown, to facilitate their breaking up in case it is desired to do so. The hook H, by which they are handled, should be placed in a pocket, as when this is done they can be piled one on another without having to resort to blocking.

Where a molder is compelled to use a flask with burnt joints, he should see that sufficient wedges are inserted to keep the mold in its original position before the clamps are drawn tight. If he neglects this he will have a casting varying in thickness according to the extent the joint is burned away. When the pattern in a flask of this kind comes so close to the edge that there is danger of a runout the molder should guard against this by clay-washing the joint after the mold is closed and filling the cavity with molding sand. A board may be fastened between the clamps and the flask to support this, if danger exists of its being forced outwards by the iron, or the board may be attached with screws, please do not try to use nails, experiments in that direction have never been successful.

In trying different ways of keeping cast plates straight I have found that stripping from corner to corner in the form of an X gives the best result, with the exception of the light plates having bolt holes or other openings near their edges. These I strip to within ten inches of each corner, and sometimes to keep them from cracking, it is necessary to make a small channel around the edges, and to fill this with iron to induce equal contraction.

Gates.

By ELI H. PEARCE.

In gating a thin casting it is well to do a little thinking beforehand, always remembering the fact that in entering a mold, fluid iron behaves exactly the same as water would, viz: It will seek its own level and

will run faster down a slope than it will over a perfectly level plane.

I was once favored with considerable experience in making some plates six feet long, four feet wide and three-quarters of an inch thick, with a rib three inches deep, running across the plate in the center.

My fist plan was to mold the plate perfectly level and pour it with two ladles, one at each end, but this plan was not satisfactory for in my first heat I lost several plates.

The castings run, but where the rib run across was a dirty streak that looked as if the metal had cold shut at that point, a plain seam being visible. Fortunately there was nothing particular about the job and the castings were accepted. But I was not content to let the firm's name appear on such castings and resolved to do better.

The next heat I only put in two plates. One I molded on a slant lengthwise, making the end that I was going to pour into about two inches higher than the other end. I poured the mold with two ladles, but used both on the high end, cutting a double gate near the corner on each side. This plate was a great improvement over my first, but still showed some dirt over the rib.

The other plate was molded level lengthwise but on a slant sidewise of about two inches. This one I poured from the high side, cutting a double gate about a foot from each end and poured with two ladles. The result was all that could be asked and the plate was smooth and clean.

After this I made a great many of these plates and never lost any through the fault of the gates, although I quit pouring with two ladles and only used one, retaining a multiple gate or one having several inlets into the mold.

The solution of our first failure is that pouring on a level from both ends the iron rushing in carried what loose sand there was in the mold along with it and meeting in the center of the plate, caused a dirty streak to appear.

Being perfectly level, the iron did not move fast enough to reach the center before it began to get dull, causing the cold shut. To still further cause us trouble, the rib running across the plate required an extra amount of iron to be supplied just when the point was reached that was furthest from the pouring gates.

In the plate cast on a slant lengthwise the iron ran smoothly until the rib was reached, then it fell to the bottom of the rib, making a slight stoppage in its onward flow causing sand holes in the face of casting over the rib.

In the last plate the iron entering the side of plate and flowing in the same direction that the rib run caused the iron to run evenly and prevented any blemish appearing.

There is a lesson to be learned from every failure and I have adopted a resolution that when I make a failure to try and determine the cause. If I locate the trouble I take the necessary steps to overcome it. If I cannot locate the trouble (which is seldom the case), I will try some other method of molding the next time. I am not much of a believer in luck, but do believe that all failures can be traced to a cause and that if a mold is properly made and gated, well vented and rammed, poured with iron having a sufficient degree of heat and at the proper speed, it will produce a good casting.

I must ask the reader to excuse me for entering on a widely different subject, when I appropriate additional space to refer to an article by Chas. Butterfield in the October FOUNDRY.

Some six or eight years ago a nicely dressed "gentleman," with polished manners, called on us, presenting his card, which, I think, gave his firm's name as some kind of Beauxite and Aluminum Alloy Co., of Rome, Ga., that claimed to manufacture the only reliable cure for all ills and evils that iron is heir to. He informed us that he had heard of our progressive spirit and some other nice things, winding up by telling us that he only had a few moments to spare in our city and that if we wanted to try their wonderful discovery that he would ship us five hundred pounds of his wonderful alloy at six cents per pound. *We swallowed the bait.*

In due time the long-looked for barrel came C. O. D. *We paid for it.* A few days afterward we used some of the great cure; but after the heat was over, when we examined our work we found our castings no better, softer, or sounder. *Then we swore.*

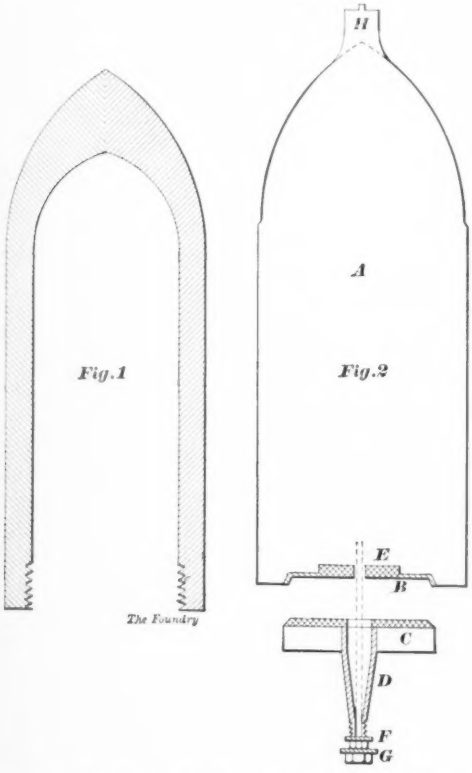
Since that time I let all these new and wonderful things alone until I hear reliable people speaking well of them, then I bite, but only a small bite the first time. Then if the taste is good, I bite off a larger chunk next time.

The Making of Large Projectiles.

By JAS. A. MURPHY.

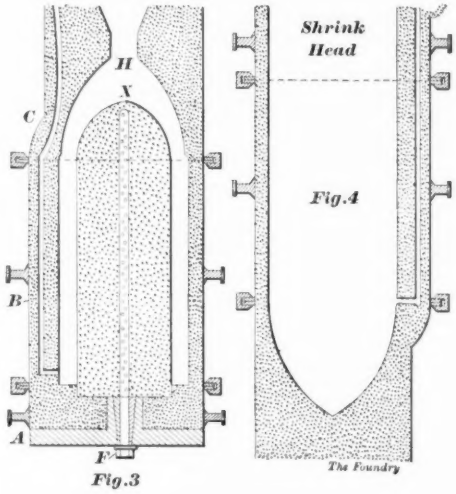
The molding and process of making projectiles is in itself, and would be termed in mostly any foundry doing a similar class of work, a "plain job," and so it is, once the right method of making it is understood, and the proper "rig" and tools to work with are in sight. Fig. 1 is the sectional elevation of a shell as wanted, and the first requirement is the pattern, Fig. 2.

Large shells are mostly cast point upwards, for reasons which I shall explain further on. The body A, Fig. 2, should be



made of good, strong timbers, and while it is not necessary to have the body solid, it should be made so that frequent or hard usage would not distort its shape or pull it apart in drawing the pattern from the mold. The socket joint of pattern, B, is a very important part, and great care should be taken in having it the exact size, so that it will fit true and lay level on the core print, C. Both B and C should have bearings of brass, and the stem, D, should be of brass also. The stem should be hollow so as to allow the bolt, G, to pass up through it and screw into the piece E, so as to fasten both parts of the pattern together in a thoroughly reliable manner. The point is made as at H, and the small projection on top is simply a pin to set the riser head on to prevent it from being rammed out of place.

Figs. 3 and 4 will give an idea of how the flask or casting is made, as well as showing a sectional view of the mold. The core box and core rod are made on exactly



the same principle as those described by me in a similar article in THE FOUNDRY for May, 1899.

Supposing that we have enough "rigging" we will start the job, and the first thing wanted is a good, big sand-heap of an open mixture of bank or fire-sand, old core sand and some molding sand to give it body, wet down with good clay wash. It is not necessary to go to any expense about mixing facing, as is too often the case in dry sand work, where there is no need of it whatever. A good blacking gives all the facing required for the majority of dry sand jobs. The print C is taken and securely fastened in the drag A, Fig. 3, by putting the stem D through the hole in the bar and fastening it with the nut F. The drag is then set on a level mold board, provision being made to have taper of core print below the level, and rammed up solid, turned over and joint made. Then set on the body of pattern and from underneath tighten the bolt G and the whole pattern is firmly held together, as it must be to produce a perfect casting. Place the drag

on a bed of sand and adjust the core gate where wanted; set the runner stick, after which put on the cheek B and clamp together. Ram up good and solid to the top, make joint and hoist on cope C, set runner on top of the other in the cheek and ram up as high as the top of pattern at H, when you put shrink head on, after which the cope is rammed to the top; strike off level and roll the whole flask over. Then take out the bolt G, knock off the clamps and lift off the drag which is now on top. Take out the print and finish. The pattern can now be drawn and the metal piece E is of great advantage, as a good screw can be inserted instead of the bolt to draw it up with. The cheek B can then be taken off and as the mold is in three pieces, it is easy to finish it.

After a good deal of experimenting I found the following mixture of blacking to give the best results: 1¼ parts plumbago, 1 mineral and 1 charcoal, wet with thin clay wash. One part of each, however, makes an excellent mixture. It is, as all blackings are, best when mixed a couple of days before using. Put a good thick coat of it on the mold with a nice soft swab, and slick it neatly, after which go over the whole surface with a camel-hair brush and molasses water; place the three parts one on top of the other in their regular order, separating them at the joints with pieces of packing, and hoist the whole business on the oven carriage.

When dry, take off drag first and fasten the core to it as shown in part A, Fig. 3, filling up the apertures around the core print with ordinary green sand facing and black it over, after which if the mold is hot, rub on some oil. Mud facing would do just as well, and for the purpose of economy, would probably be better. Put on the cheek B and center the core, after which put on the cope C and clamp. Pour the mold hot and fast and then sing "How would you like to be the ice man?" as those shells, particularly the 12-inch ones, require churning for three-quarters of an hour. The job of churning or feeding must be well done, if not, a hole will appear at X.

The adopted design of shells from a designer's point of view is faulty, and a draw at that point is almost unavoidable; when such occurs it is annoying to the foundryman and to the molder also to have some army officers condemn what would have been an excellent casting were the faults of the design remedied, if such a thing is possible without detracting from the usefulness of the projectile.

Another point not to be forgotten is: Never light the vent at the bottom while the mold is being poured. If the vent is suddenly ignited, the shock is very often liable to throw off the top of the core over the hollow rod and spoil the casting.

It is best to gate these castings about an inch or so from the bottom, as the mold is not then so liable to break in.

The making of solid shot is far easier indeed. It would be hard to imagine a plainer job in dry sand. Fig. 4 fully explains the job. The flask used for the shell is reversed and they are cast open and about 12 inches of shrink head allowed, doing away with the feeding rod. The shell is made point up so as to insure a solid point, and stop the draw which always results when they are cast point downwards. The part H is turned off to the point required. A bad point or imperfections in any way are enough to condemn any shot or shell. Dust is always plenty in a foundry, and a small quantity lodged in the point of a shot mold would spoil it. It is necessary, while the mold is green, to shove through the apex of the point a thin vent wire so as to have a small hole that the dust can lodge in. A sixpenny wire nail is about the largest thing that should be used for that purpose, as when a larger projection breaks off, it leaves the point too blunt and it cannot be filed down, as the point is invariably shorter than it should be. On the body of shot and shell above the cone, a good allowance of say one-quarter inch should be allowed for shrinkage and turning. The points of all shot patterns as well as shells that are cast point downwards should be made of brass or wrought iron, to prevent the points from losing shape in being rammed over or being struck with the rammer. The one pattern could be made to answer for shot and shell by having the shrink head bearing H on the shell loose, and using a piece similar to the top of shot for shot shrink head. The same flasks would do for each, with the exception of the drag part with the bar, which is not necessary for the solid shot, instead another piece of flask is added to deepen the whole, as is shown in Fig. 4.

One-half inch is plenty thickness for such castings and there should be plenty of holes cast in them to facilitate drying and allow for the escape of generated gases during casting. Trunnions or journals should be on each part of flask, and they can be handled with great ease on a properly constructed air hoist with an overhead track from the floor to the oven-carriage. The gate should be set on a slant against the pattern so as to give the very necessary whirling motion to the metal in the mold.

He Hasn't Time to Read.

The trade journals, without particular class distinction, make extraordinary efforts to secure news that will be of value and interest to their patrons, and readers. They closely watch the field of scientific research and the fold of practical industry for anything that may be of material benefit to those engaged in the particular industry to which they are devoted. And the manufacturer or artisan who makes an eminent success in his special calling is indisputably the one who provides himself in a generous way with the journals devoted to his interests, because very often a single article contained in their pages furnishes information worth the price of subscription a thousand times, and which may have required twenty years or more of costly experiment and unceasing labor by some bright mind to demonstrate and perfect.

It is entirely safe to assert that there is not a single issue of any of the various trade journals that does not contain information worth many times the yearly subscription price if it is properly studied and made use of, or stored up in memory for future use. I am going to tell you a few things that have come under my observation in connection herewith, and I want you to understand that I am dealing out truth, plain and simple, without spice.

Hiram Knowitall is a manufacturer; he has been having endless trouble and expense with a certain line of his machinery. In his office upon a dusty shelf are numerous copies of dust-covered journals devoted to his industry; his desk is strewn with papers in dire confusion; his yards, factories, shops and warerooms resemble the path of a cyclone; men are standing idle here and there; running expenses are accumulating on every hand, and Hiram Knowitall hasn't a moment to spare. A representative of a journal that he has been receiving almost regularly for a long time in the way of sample copies, approaches him for a subscription to the paper, and Hiram growls out, "Don't want it, I haven't time to read," and Hiram and a dozen men go to tinkering around that line of machinery that won't work, and another dozen men stand waiting. After a while they get it started in a middling way and run for half an hour, and then steam runs down, the Dutch oven don't work right, the draft is defective, there is something wrong in its construction, and there is another wait until the steam comes up to the running point. By chance I had noticed a sample copy in the office of a journal whose contents I was familiar with, and I knew that it contained the solution of a part of Hiram's troubles, and I took him into the office and I turned to the article and I pointed him to it; he read it and turned to the cover and looked at the date and said, "I wish I had seen that two months ago," and he could have seen it had he taken time to read it, and I went for the dusty shelf and hunted through the dusty papers and soon found a paper containing the solution of his "Dutch oven" troubles, and a month later he was good enough to admit to me that in neglecting to read his trade paper he had neglected a very important part of his business.

I met another man; his name is "Go-easy;" he takes a paper, but don't read it; he needed a certain machine very much and he asked me if I could tell him where he could get it. I picked up his paper, and there, right on the cover was the very thing he needed, and within ten minutes his order was on its way.

There is another man, and I think this is the most despicable of all; he needs a journal devoted to his interests, but will not subscribe for one; he can get a good paper which would be worth several hundred dollars a year to him for a dollar or two, but it's "no go." His neighbor, a mile or two away, takes a paper, and "Old Pennywise" spends fifty dollars worth of time each year in going over there to read it, and find out where to buy his supplies. Of course, it is true that the above mentioned class of individuals do not constitute a very large

percentage, but there are such, and there should not be, and it is not with a spirit of harsh criticism that this is written, but simply beneficial advice.

It is a difficult matter to understand the man's mode of reasoning, who subscribes for a paper, but when he is shown a copy he almost devours the advertising columns in his eagerness to see what is advertised there in his line of wants, and he will note down perhaps a dozen manufacturers producing something he needs; of course, he will subscribe when you go after him. But why hasn't he subscribed before?—D. H. Bloomer in Age of Steel.

Old Cannon Balls as Scrap Iron.

In referring to the scarcity of scrap iron, the New York Commercial says quantities of Cuban shot and shell are being imported into this country and are eagerly snapped up at prices varying from $15 to $17 a ton. In fact, all kinds of old iron are being forwarded from West Indian ports.

From Cuban sugar plantations which were wrecked during the war, big consignments of the disused iron are also being shipped to New York. A vessel carrying a cargo made up of 2,000 tons of this iron and also several hundred cannon balls is now on its way to that port. Some 3,000 tons of cannon balls were consigned in September to Glasgow, direct from Cuba. Negotiations are now in progress for the importation into the United States of all the old iron that can be found. Five thousand tons have been shipped to America within the last two months.

A well known New York speculator in scrap iron is asking for bids on cannon balls which were to be imported from the Philippines.

The Same Old Rose Under Another Name.

The heading of this article is not ours. The credit for it belongs to one of our subscribers, who sends us a circular issued by The O'Keefe Company, of 1232 Penn avenue, Pittsburg, Pa., in the interest of a flux that is claimed to remove anything from sulphur in iron down to the money in certain people's pockets. Its name is Ferro—Nickel Manganese Calcium Fluoride, and our readers will recollect that the first chapter in its biography appeared in the October issue of THE FOUNDRY. This flux has quite a pedigree, which is nothing to its credit. The way it is being advertised and the amount of virtues claimed for it makes us think that it is a universal remedy, which, after the elapse of a few more weeks, will remove warts and pare apples. Here is the way the O'Keefe Company tells its story:

FERRO-NICKEL MANGANESE CALCIUM FLUORIDE.

A new chemical composition which absorbs carbon and detrimental gases from molten iron, copper or brass, making the metal more fluid and free from sponginess and air-holes. Ferro-Nickel Managanese is free from phosphorus, sulphur and carbon, and has a very low melting point.

The properties of nickel manganese when it is combined with iron, steel or copper, are known to increase largely their tensile strength and their resistence to oxidation. It also increases the fluidity under heat, giving cleaner and sounder castings; and to produce these results a surprisingly small admixture is necessary. Alloyed with brass or copper, it improves alike in tensile strength, its color and durability, and gives a dense, solid casting, free from porosity. The difficulty in the use of pure aluminum, or of alloys of aluminum, is to obtain a perfect mixture of the grades of iron. Ferro-Nickel Manganese Flux gives more perfect castings, purifying the metal, and making a clearer and more complete separation of the slag and impurities, than by any other known process. An amount of the flux from one-half (½) to one (1) per cent only, is required to effect the above results. As an admixture with copper, a gain of tensile strength of fifty (50) and more percent is made by the addition of only 1 per cent of the flux, and the metal casts perfectly solid and free from air-holes.

Directions for ladle use:

Iron.—Put one (1) per cent in flux, of the weight S. O. iron, into the bottom of the ladle, and pour the molten metal upon it. The flux will cause all impurities in the iron to rise immediately to the top in the form of "slag." The effect of the flux is to increase the heat to a large extent, rendering the metal more fluid, and hence a wait of a few minutes before pouring will be beneficial. It is found that in the best qualities of iron a less percentage gives better results. In some foundries, one-half per cent of flux is put in

the furnace (throwing the flux on the coke, just before the iron, in each layer), and the remaining half per cent in the ladle as above.

Copper and Brass.—Put one-half of one per cent in the bottom of the ladle and melt it with the metal. When the mass is melted, throw a little of the flux upon the top, which will prevent the evaporation of the copper, and keep it hot. It is recommended that the melt be made very hot, in order to fully fuse the flux.

For Cupola Use.—Ten pounds of flux to each 500-pound charge of iron in cupola.

For Soft Mild Steel Castings.—Use 50 pounds flux or 2½ per cent to each ton of iron in converter.

For Projectiles.—Use 100 pounds flux or 5 per cent to each ton of metal in crucible.

For Armor Plates, Grade "A."—Use 500 pounds flux to each ton of metal in converter.

For Armor Plates, Grade "B."—Use 400 pounds flux to each ton of metal.

For Puddling Furnace Use.—Take 20 pounds flux to each ton of metal.

For Pig Iron Blast Furnace Use.—Take 25 pounds flux to each ton charge of ore.

For Hot Air Furnace and Malleable Iron Use.—Take 20 pounds flux to each ton of metal.

Price in 100 pound lots, 12 cents per pound.
Price in 300 pound lots, 10 cents per pound.

* * * * *

Iron, steel, copper, brass, armor plate, projectiles, etc., it is all the same. All that one has got to do in order to get just what he wants is to grease the pig iron with a piece of flux bearing the sneezing name. In order to show the readers of THE FOUNDRY how lenient the fool killer is with these people, we will make a few calculations, using their own figures. For blast furnaces the O'Keefe Company recommends that 25 pounds of flux be used to each ton of ore charge. Assuming that we have an ore carrying 60 per cent of iron it would require 3,750 pounds of ore to produce a ton of iron of 2,250 pounds. At ten cents per pound for Fluoride Nickel Calcium and the balance of the ingredients that goes with it, it would cost very nearly four dollars and seventy cents for flux alone in producing a ton of pig iron. These figures should be sufficient to show the absurdity of advising the use of this nostrum in the manufacture of pig iron. Of course blast furnaces, at least some of them, are coining money, but they are hardly going to throw it away.

For cupola use the foundryman is not likely to tax himself four dollars per ton of iron melted for flux. Of course for armor plate the Carnegie Company might possibly be able to afford to consume 500 pounds or fifty dollars worth of this medicine for each ton, but they are hardly to be expected to take it in such large doses.

The O'Keefe Company have started out in the wrong field with the flux with the long name. They should put it up as a worm medicine or get Mme. Yale to recommend it for the complexion. It would be as good for these purposes as it is for armor plate and castings.

Shrinkage of Brass Castings.

By P. LONGMUIR.

In your October issue Mr. Roxburgh gives some of his observations on the "Shrinkage" of brass castings. May I add one or two of my own experiences?

Firstly, the vertical is not the correct position for casting brass or indeed any alloy liable to "segregate." The writer recalls experiences of shaft liners up to 30 feet in length. In these cases the horizontal, or only a little inclination, gave results far surpassing the vertical position of casting. Propeller blades are another instance—the horizontal position being adopted in all cases when cast of gun metal or brass. Manganese bronze is, however, an exception; the vertical position does give better results with this alloy.

Another feature of interest is that gun metal test bars cast in the horizontal position give better tensile and elongation results than do those cast in the vertical position.

The shrinkage or "draw" of brass is more or less a question of temperature and judgment. With proper manipulation of metal, disposition of gates, arrangement of casting position and correct judgment as to casting heat, almost any weight of gun metal can be cast with little or no need for a feeding rod. The writer has in mind propellor hubs and similar castings of about five tons in weight, which turned out as solid as could be desired, and that without the aid of a feeding rod. But it is more or less a question of temperature. Dull metal is apt to draw into cavities in which sometimes may be seen a button, high in tin, and which has the appearance of having oozed through after the

main body of metal had set and the cavity formed.

In addition to these cavities "cracks" are often found with gun metal cast at a dull heat. These are seen to best advantage at the junction of thick and thin metal in the corners of a casting, or if there be a flange, round the junction of flange and body. These cold cracks are a source of trouble to the brass founder. They are at times so fine as to only show when tested hydraulically, and at other times will be ⅛-inch in breadth, almost severing the casting.

Castings with these faults when remelted and cast at the proper temperature come out right.

One point may be added before leaving this subject. In casting brass the mold should be quickly filled; otherwise flakes of zinc oxide gather on the top of the rising metal and are in effect equal to dirt, forming dross and giving a dirty casting.

With regard to copper castings, swelling would be due, not to excessive temperature, but rather to the absorption of oxygen. Sound copper castings give a contraction of about 7-32 inch per foot. The difficulty is to get a contraction at all. The expansion or non-contraction of copper castings may be due to the gases absorbed during melting being liberated on solidification.

Feeding, or the Compression of Metals.

By WM. ROXBURGH.

In the September issue Herbert M. Ramp emphasises that "Cores do expand and do effect shrinkage," and evidently thinks he has driven this point home with satisfaction by asking, "How is it that a hole cored in a casting shows less shrinkage than one made with green sand, and why it is that a casting made in green sand will show greater shrinkage than one made in dry sand and poured from the same ladle?"

My answer to the first of these questions is that the dry sand core, on account of its being baked or dried, becomes almost immune to hydrostatic pressure when compared to the one made in green sand. Then as to the latter question it is scarcely practically correct, as some green sand castings do show greater contraction on certain parts and yet show less contraction on the aggregate of its extremities. This explanation cannot be difficult to practical minds to comprehend when we know that many castings are made in dry sand when green sand would do quite as well, and shall we not say the cores also possess the necessary resistance.

With regard to cores, whether made in Scotland or America, the sand necessary must have porousness for venting and cohesion for binding, and the more vegetable matter that such a sand contains the better adapted it will be for the purpose of the molding. Further, it would be difficult to believe that any molder who thoroughly understood his business, could be at a loss in compounding a core sand because of the many articles advertised as "binders."

If Mr. H. R. Kamp has departed from the "good and old way," or has laid aside the "hat his father wore," I am afraid that others of his countrymen have taken it up and are wearing it for him, else the recent American publications I have before me belie themselves, as these recognize the utility of those very adjuncts, viz.: horse manure and sawdust, which he says has passed away in his country."

As to feeding or compressing a ten-ton anvil block. The last one that came under my observation and which was much heavier was cast in open sand, and immediately afterward covered with a carbonaceous compound. This gave more superior results than could be had from feeding with a rod, less the appearance to the eye, common to all open-sand castings.

I have for a number of years given American foundry practice a good deal of attention and have mingled with American molders as shopmates; indeed I can safely assert that I have come in contact with men from most if not all the principal cities of America and Canada at some time or other, and at all times made good my opportunities of interchanging opinions on foundry matters, and have now come to the conclusion that after all, foundry practice is very much the same the world over.

How can it be otherwise, since it is an admitted fact that the law of expansion is relatively the same, whether casting in the sunny south or the Arctic regions. And so it is with cause and effect in hydrostatic pressure, those two items in my opinion being paramount to all others, the remainder being subsidiary and their variableness in American and British practice are no more remote from each other than the difference that exists with localities in either country.

The Work Seeks the Producer.

Just as capital is looking for labor instead of labor hunting for capital, so those in need of material are looking for those who can furnish it. Instead of industrial works seeking contracts, people who have the latter to place are finding that they cannot dispose of them as easy as a few months ago. The American Machinist recently related the experience of a manager of a machinery building concern which is of interest as showing the present condition of the market for some of the things needed in machine construction. This man had a contract with a large steel casting establishment to furnish 150,000 pounds of steel castings per month. The foundry, however, could deliver only half as much as it had agreed to, and finally, being pushed for the work, he started out in search of a foundry which would do better. He was prepared to place a contract for 300,000 pounds of steel castings, to be delivered 75,000 pounds per month, and naturally thought that a man prepared to place such a contract would receive some consideration, an opinion based, of course, on previous experience in similar lines. The first place he stopped at was a large establishment in which, after considering the matter rather calmly and indifferently, they proposed to make his castings if he desired them to do so, but on making the price their figures were found to be more than four times the price he was already paying. He remonstrated with them about this and called their attention to the fact that the castings were not small ones, but were large and of heavy section. They said they knew all about that and understood it thoroughly, but that that was their price and they would make no concessions. Finally, when our friend was informed that no deliveries could be made within five or six weeks after receipt of order, he left to go to another place. This was a smaller establishment which was just getting into shape for doing work. This concern had previously sent him a letter, asking for blue prints and specifications of steel castings that might be desired, and he thought that surely here he would find people anxious to take his contract. He found them not fully organized, and with only about a day's supply of pig metal on hand suitable for his work, and with no positive assurance as to where any further supplies of it were to come from. On going into the office he discovered evidence that duplicates of the letter he had himself received had probably been sent to about all the other steel casting users, this evidence being in the shape of an imposing pile of blue prints and specifications on the manager's desk, showing that everybody using steel castings had probably jumped at this apparent chance for getting some of them. There was no prospect of doing anything here. At the third place he visited he was greeted by a face which appeared at a pigeon hole, and in answer to his inquiry stated that they wanted no more business for the next eight months at any price or on any terms. Two other concerns panned out to about the same result, and the final conclusion of our friend was that the people who were already giving him 75,000 pounds of steel castings per month on a contract calling for 150,000 pounds were doing pretty well. By vigorous talk to them regarding what arrangements he might make with other foundries if he only chose to, he extorted a promise from them that they would do better.

They are Holding Their Own.

There is a saying, credited to the late Prince Bismarck, to the effect that in a nation being prepared for war is its strongest assurance of peace. The same may be said of labor unions, whose preparedness for war depends upon the amount of cash they can command in case of hostilities.

The last monthly report of the Friendly Society of Iron Founders of England, Ireland and Wales shows that it has on hand a cash balance of nearly ninety thousand pounds sterling, or close to a half million dollars. This is a tower of strength, with which no foundryman could hope to cope single-handed. The Employers' Federation is an association composed of the principal firms in the engineering trades in Great Britain, and it, too, of course, has plenty of financial strength. It is probably true that a well filled treasury of these two associations has inspired respect for one another, and that the result of a serious struggle is avoided, and the differences arising between them arbitrated, simply because an untold loss would be inflicted on both participants in the combat.

The ability to perform the trick of making good castings is only acquired through experience.

THE FOUNDRY

Published Monthly by

THE FOUNDRY PUBLISHING CO.

DETROIT, MICH.

JOHN A. PENTON, - - - EDITOR.

SUBSCRIPTION PRICE:

$1.00 a year in advance, postage prepaid in the United States, Canada and Mexico.

$1.75 a year to other countries, postage prepaid.

Single Copies, 15 Cents.

ADVERTISING RATES ARE PRINTED IN EACH ISSUE.

Space in advertising pages only is for sale.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.

The Detroit News Co. will supply the trade with THE FOUNDRY, through the regular channels of the American News Co.

We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.

We can not furnish a continuous set of back numbers beyond March, 1899.

Entered at the Post Office at Detroit, Mich., as second-class matter.

Trade Outlook.

With the production of iron getting closer to consumption, the feverish condition, at times, so noticeable during the past eight months, is disappearing. While such is the case, there is no indication that present prices will not be maintained. Blast furnaces are starting up here and there, but in the main their output is too small to in any way affect the market.

Many foundries have been obliged to borrow both coke and iron from one another to keep their shops going, but it is usually the smaller concerns who are doing this. A shortage of cars by the railroads as well as the habit of some foundries not to order material until it is needed is more to be blamed for this condition of affairs than any real inability on the part of coke and iron producers to fill orders.

Two Minds in the Same Groove.

We publish in this issue an article by R. H. Palmer on "The Casting of Plates," and following it will be found an article on "Gates," by Eli H. Pearce. Mr. Palmer is a citizen of the great little state of Rhode Island, Mr. Pearce's residence is in Louisiana. Thus these two persons are many miles apart, yet after reading the articles quoted above a stranger might think that between them there had existed some sort of mental telegraphy.

It has been a standard rule that molds, especially those having large flat surfaces, should be cast while perfectly level, yet here is two practical foundrymen, hundreds of miles apart, who at the same instant illustrate that, as far as plates are concerned, better results are obtained by having one end or one side of the mold higher than the other. There is no theory about it, the method has been tested and molders throughout the country may feel like corroborating the evidence so far put forth.

It is very seldom indeed that two articles, dealing so closely with one thing, and interwoven with individual experiments tending to the same end, reaches us simultaneously.

A Reflection.

Molding is, after all, much the same the world over, at least as far as jobbing work and general castings are concerned. It is only when it comes to special lines that American foundrymen have forged to the front, in lines where every man becomes simply a piece in a gigantic machine, in lines where it may be truthfully said, that the real molders' skill counts for nothing.

While on a recent visit to this country, the manager of an English foundry said that he should not want his molders to work after the manner he had observed in vogue here. It must be acknowledged that there is nothing particularly elevating in the sight of a shop full of half-naked molders working on the piece-work system. Almost any car works or stove foundry will furnish an example of the fact that we are wearing men out fast. There is practically no such a thing as old molders in these shops.

Great Britain has for a long time been, and probably will for an indefinite length of time into the future continue to be, the cradle of good molders. Go from one end of this country to the other and wherever you find good shops, good work and good workmen, you will also find the brogue of Scotland and

England. These men may not be able to put up sixty oil boxes or half a hundred radiators in a day, but the patient training of their youth makes them molders, who can not be duplicated, not automatons.

One feature of our conditions which makes it extremely difficult for foundrymen to retain competent molders is the wide fluctuations shown on their order books. If a foundry can give continuous employment it will experience but little difficulty in keeping the best of molders. The method our shops have of securing a large order and rushing it through may tend to lower the cost of production, but good workmen can not be retained permanently by a shop that is only in operation about nine months in the year.

What we need to make good molders is steady work. Steady work at fair prices will produce better workmen than spasmodical spurts at higher figures. The British workmen may not be the highest paid mechanic in the world, but the much more uniform employment which has fallen to his lot, has made him one of the best, a man whom it is not necessary to ask where he served his apprenticeship.

Don't Know what He can do till He Tries.

We received a letter some time ago from L. A. Lelaurin of the Dilley Foundry Co. at Pine Bluff, Ark., which, although not intended for publication, contains so much solid sense that we are going to give the following part of it away:

The Cotton Belt Railroad has a brass foundry at this place, but only keep one man at work. One of the boys in the Dilley foundry went over there one day and called his attention to the amount of information furnished by THE FOUNDRY throughout the year. The brass molder explained that he did not need information, that books were of no use. To hear him talk one would think he knew enough to fill a big book, but from investigation I am satisfied that what he does not know would fill a far larger volume.

Last Saturday he came into our foundry and while there a machinist broke a lug off a casting. In calling my attention to what had happened I told him to bring the casting into the foundry and I would cast a new lug on. The brass molder, who knows everything, said that I was crazy to talk that way. I acknowledged that I did not have as much gray matter as some people, but when casting time came around I put a new lug on that casting just the same and made a good job of it. Then the brass molder explained that this result only happened through an accident, to which opinion I am willing he should adhere.

We can do a lot of things if we go about it right and use what mechanical knowledge we can pick up, whether in the shop or in books, together with a good deal of common sense. Last spring our cupola had become worn out at the bottom and it looked as if we would have to take the whole stack down in order to put on a new bottom piece. I thought I could see my way clear to get around this. Several people kind of smiled when I proposed to insert a new piece while the upper part was suspended in midair. I had four legs made, took out a few bricks above the charging door, cut notches in the shell and put four jack screws on to hold the upper part firmly. Then I had the boiler maker remove the worn out portion and jacked the twenty feet of stack up a bit. When the new section was ready we lowered this down to its right place with the jack screws and riveted the two sections together. There was not a brick lost during the whole operation.

Always Room for Improvement.

Last month we published some experiences of Thos. Wathey while employed at a certain foundry in Arizona. As near as we remember the way the plant had been conducted previous to Mr. Watheys advent had been anything but a credit to the company, financially or otherwise. Either this concern must be sliding back to its old methods or Mr. Wathey left them enough brains to run their shop satisfactorily for several years to come, as a short time ago we received a note from these people which said: "We really have but little need of your publication, as our foundry work is of a plain and routine character, and not at all similar to the operation of a custom shop. We have no doubt your paper would be valuable in a general foundry."

Here is where we are stroked the wrong way.

THE FOUNDRY is of use to the man who makes nothing but sash weights just as well as to the shop that makes no two castings that are alike.

Because the output of a foundry is of a plain and routine character this is no reason to even suppose that the method of turning it out can not be improved.

Car Wheel, Radiator, Pipe and all foundries working on a specialty have lowered their cost of production, first, by learning

what others are doing, and, secondly, adding thereto the best improvements that they themselves have been able to bring forth.

It is a shop's own originality that places it ahead of its competitors. The mere imitating of the practice of others only places it on a level.

There is no foundry so perfect that room can not be found for improvement.

Where is the Limit?

Since boycotts were first introduced some ludicrous positions have arisen that are, to say the least, laughable. The following item from a Springfield, Mass., paper shows an extreme example:

"The molders are grinding their axes and sharpening their sledge hammers to go to battle with the Springfield Foundry Company, which is using four scab wheelbarrows that were bought of the ——— company."

Such reasons for going to "battle" should be tabooed. Carried out to their logical conclusions, they would keep the whole country in hot water all the time.

Another example of the acute "independence" so often shown by the molders comes to us from Hartford, Conn. As is well known, the time keeping feature of a large establishment entails considerable outlay, to reduce which, and also to guard against mistakes on the part of the timekeeper, the majority of firms have introduced time registers by which the workmen record their own time. A short time ago the ——— Company, of Hartford, Conn., purchased five of these machines, one of which was installed in the foundry. No objections came from the other departments, but when the knights of the sandheap spied the device they instantly concluded that life would be a burden for them and notified the superintendent that while other mechanics might stoop so low as to record their own time, the molders would refuse. To avoid trouble it was agreed that the molders should be exempt from doing what other employes cheerfully did, and the matter was thought to be settled. Later on, however, a delegation again called upon the superintendent with the demand that the obnoxious time recorders should be immediately removed from the foundry. The superintendent explained to them that the company had already exempted them from recording their time, and asked them to wait for its removal until later. To this the molders replied that nothing but the unconditional surrender of the company would satisfy them and that this should take place immediately, failing in which the company could run its heat off as best they could.

We have heard much about the downtrodden molder in the New England States, but evidently Hartford should not be included. It is actions like these that give the employer just claim to say that he is not allowed to conduct his own business, and who shall blame him if, when conditions are in his favor, he shall try to regulate affairs in his own way when they are his only?

It Must be a Pearl.

The Bettendorf Metal Wheel Company has its new iron foundry furnace blown in, and at work. Foreman T. A. Larkin says it is a jewel, and seems to feel an affection for it that is almost human. It is the most perfect piece of mechanism of its sort that has been seen in this part of the country, and it does its work perfectly. The regulation of the output of the furnace is positively in the hands of the operators, and it can be made to yield a thin stream of fluid iron, or a flow as large as a man's wrist, running as high as eight tons an hour. It continues to receive charges of iron and fuel right along through the process of melting, and the process is practically continuous. The new furnace in the brass foundry of the same works has just been started in operation, also, and it is equally fine in performance, though of much smaller capacity.—Davenport (Iowa) Democrat.

The Kranks Korner.

I like the way Stuart R. Carr & Co., of Baltimore, come back at me in the November issue of THE FOUNDRY. There is a certain snap and vim about their letter which makes me think that these people are very much alive.

Nothing like criticism for me, it is the one element that makes me gain in weight. When I hear my neighbor say, "There is that fool krank shooting off his bassoo again," without showing me wherein I may be of better use to society in general, I begin to fall off. When I am tackled right on my own proposition the pointer goes the

other way. Just to entertain Messrs. Carr & Co. and incidentally show other foundrymen how they might advertise to advantage, I will tell a little story from life.

* * *

Down in Pennsylvania there is a town called Coatesville. Some years ago an inhabitant of that place by the name of Ridgway started to build cranes. Nothing peculiar about that. Lots of people build cranes.

Old man Ridgway had a boy, forget his Christian name just now, anyhow the concern is known as Craig Ridgway & Son. I don't suppose this boy of Ridgway's differed much from other boys, except in that he may have paid a little better attention to his work than the average boy.

At any rate, this boy developed a few ideas that other people had neglected to mature. Cranes had been built a great many years, by any number of concerns, before Ridgway went into the business. Whenever a man started to build cranes he put a few two-inch advertisements in different papers, let the thing take care of itself from one end of the year to the other, paid his bills every three months, and felt, no doubt, that he was doing all the advertising any man could do.

* * *

Did Ridgway & Son advertise like other people did? Did they fold their hands and say that their line of business could not be advertised, just because other people said so? Did they say simply that they made cranes, and trust to Providence to knock intending purchasers into seeing that their crane was the one they should buy?

Indeed not. They believed they were making a crane that a great number of people wanted, if they only knew about it. They believed they were making a crane that was worth talking about, and the next thing young Ridgway was getting out his now well known sermons on this subject. If intended for a weekly paper, a new sermon came along every seven days, the same advertisement seldom appearing twice, unless as Ridgway puts it, "when they are too busy making cranes."

* * *

It may be that castings can't be advertised like cranes, but I doubt it. I am satisfied that if Carr & Co. had Ridgway's boy for a partner that their business would be advertised.

Every time I look in Bradstreets or Dun's it seems to me like the Ridgways have climbed up another letter or two. And I can not help but feel that this is due as much to the original advertising they have done in behalf of their crane as to the good qualities of the crane itself.

* * *

People may know what castings are, so they know what cranes are. That is not the point at all in this argument. My contention is that people can be influenced in buying castings just as well as cranes, by the right kind of advertising.

Everybody has the chance to purchase the same iron and the same coke, yet they can not all turn out castings of the same quality. Some will make better work than others, and if I were in Stuart & Co.'s position I would certainly try to make better castings than my neighbors. If I succeeded in doing this nothing is surer than that I would try to let this fact become as widely known as possible, unless I should happen to be in the business for my health.

* * *

Business may differ in detail, yet the fact remains that by far the greater portion of humanity, architects and government officials included, are influenced not only by the qualities of an article, but by the way these qualities are held up before them. An announcement that Stuart R. Carr & Co., of Baltimore, make castings conveys no idea whatever of the quality of the castings they make. Placed among a number of similar announcements, it is simply a sign and not an advertisement. There is a chance for the foundryman to do some good advertising with benefit to himself, if he is able to make castings worth talking about. If he is not he may as well leave advertising alone, for ads., no matter how good, will not sell poor goods. There must be material of the right quality to back them up.

* * *

I believe that much of the trouble existing between the employer and the employe is due to the former changing foremen and superintendents too often.

He gets an idea that his present foreman is a numbskull with whom Providence is punishing him. The next thing we know he inserts an ad. to the effect that he wants a pusher, a hustler, one that can handle men and do all sorts of things.

The new foreman comes, and in order to show that he is a shover, he begins to find fault with things in general. May be the molders have been in the habit of beginning to wash up at 11:55. May be they have done the same thing at 5:55.

* * *

The new foreman sees a chance to show his employers where they have lost time for years. The boss' typewriter ticks off a notice to the effect that hereafter no man can quit working until the whistle blows. The foreman signs his name, tacks the notice on the door, and believes he has already done enough to make his employer feel proud of him.

It is the employer's right to run his own business. He pays the men for ten hours' work and got a right to demand it. But, does it pay to do so? Is there anything gained by demanding the last pound of flesh?

* * *

If I am working for a firm that is treating me half way right the chances are I will do the same by them. When the foreman tacked up his little notice he gave me something to think about. While I was thinking about this my mind was not on my work the way it should be. The result is that I do less work in ten hours than in nine hours and fifty minutes.

This is human nature. How easy to distribute ten or fifteen minutes so that no one can tell exactly where you lost them. An extra trip somewhere and the deed is done. The trick does not have to be taught, it is born in everybody.

* * *

Of course, abuses may exist, but after all I don't believe it pays to remove them too quickly. A new foreman may be a good thing occasionally, but I should certainly not want one who could get up steam too sudden.

It is the steady pull that counts. This thing of backing up and starting with a jerk may set the whole thing agoing, but it will never get it over the hill.

How the Pattern Maker may become a Molder.

By P. R. RAMP.

It has always been a disputed point as to who weighs the most in the mechanical scale, the patternmaker, the machinist or the molder. Each can lay claim to having a great trade, but the highest type of workman in either is found where one has absorbed some ideas from the other.

The patternmaker is a much better mechanic who has visited the foundry enough to learn of its sore spots. He will be able to render his employer a greater service if he knows the different methods to which a pattern is subjected to in molding. Not only will he give draft to a pattern where this is wanted, but he will also see that provisions are made to permit of removing the pattern from the sand without tearing it to pieces, as is too frequently the case.

The molder who pays a few visits to the machine shop will soon learn that he can ease the machinist's lot in many particulars and not try very hard either. Friction between different trades is simply due to a lack of acquaintance. The molder who goes from the machinist to the patternmaker will soon learn many ways of laying out work that comes handy to him. The method is the same, its application differs only in material, iron for the machinist, wood for the patternmaker and sand for the molder.

CAST IRON NOTES.

Devoted to Inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

STRATIFIED CAST IRON.

"Dear Sir: Last winter a foreman of a foundry told me that about twenty years ago he tried to use a pig iron that absolutely refused to mix with other irons, and there would be distinct layers. I regarded this at the time largely as a myth, but about a week ago I was up in the country and ran across a case up there which confirms me in the belief that there is something in it. I have seen in my time a good many kinds of iron. I have seen iron white in the light portion and gray in the heavier portions, but I have yet to see iron white in the center and gray on both sides. I enclose you a sample of this, and should like to have your theory as to the cause thereof, in your Cast Iron Notes. Some of the pieces that I saw up there had a good deal more gray iron and less white iron than the piece inclosed herewith. It might be interesting to have the analysis of this if it could be obtained. I do not know that an

illustration could be made thereof, but if it could I am sure it would interest your readers."

Answer.—This specimen is very interesting to anyone in the foundry business and is especially so in its bearing upon the question whether chemical analysis will explain the physical quality of cast iron. Fig. 2 is a drawing the exact size of the specimen sent to me. It will be noticed that the casting is 5-32 of an inch thick and is composed of three layers of equal thickness. The middle layer is perfectly white and hard, while both of the outside layers are dark gray and are soft. A drill will enter the soft outside but cannot penetrate the center. It is not the hardness of chilled iron but is a slippery hardness, and the drill polishes the surface, but the white portion is exceedingly brittle.

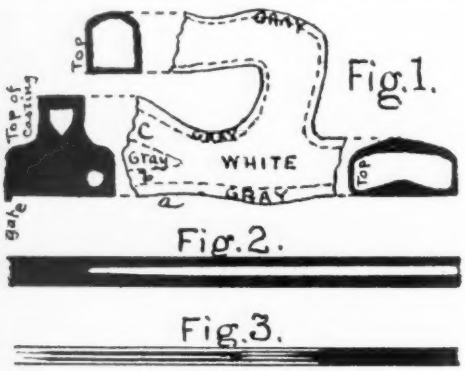


Figure 1 shows the appearance of three fractures, a single casting, all being of natural size. The gate of casting (a) is marked on one of the sections. There is a white streak surrounded by gray at b, a larger streak at c. The white at the other two fractures is nearly the full size of the section, but is entirely surrounded by a gray exterior.

This phenomena may be new to many readers of THE FOUNDRY, but I think some could furnish more remarkable specimens than these. I have from time to time had quite a number sent to me. There was no similarity of chemical composition whatever.

Should anyone wish to see drawings of some wonderful specimens of this stratification they can find them on pages 615 to 620 of Transactions Am. Institute of Mining Engineers, 1893. I gave drawings of the fractures of several pigs of iron that I found in the Swedish exhibit at the World's Fair at Chicago, and of a large number of samples which I had collected. I gave an illustration of a fracture very like Fig. 1, and gave the analysis of both the gray and the white part as follows:

	GRAY PART.	WHITE PART.
Total Carbon	3,628	3,861
Graphite Carbon	1,874	1,307
Combined Carbon	1,754	2,554
Silicon	2,846	2,742
Manganese		0,501

This shows that the silicon is practically uniform throughout the casting and that at certain temperatures the carbon will take the combined form independently of either temperature or of silicon content.

It also shows what the chemists claim, that the fracture (or physical quality) in many cases does not indicate the chemical composition. Will you allow me to make the same statement in the way I believe the founder should remember it, viz.: The chemical analysis of an iron will not indicate its physical quality, and nothing will except a physical test. In the above sample the total carbon is essentially the same in both gray and white parts and the variation in figures may be due to an error of the chemist. There must be more combined carbon in the intensely white center, but it is remarkable that one-half as much graphite was hidden from view in the white part.

The amount of combined carbon in both parts is very large in the presence of 2.80 silicon. At one time I took 15 pounds of the perfectly white portions of castings which had in other portions white centers and gray exteriors and melted them in a crucible. The resultant castings were an even gray, with no indication of white. The color of the gray part was light, indicating considerable combined carbon.

Before a further discussion of this question I am going to give a drawing, Fig. 3, of another casting, which I found in our foundry about a year ago. The edge started 3-32 in thick, and for ¼ inch wide the casting was all white, then the casting is but 1-4 inch thick and at once separates into seven distinct layers. Under a strong glass the surfaces are distinctly gray. Next are two white layers, next two gray, and at the center a white layer. Under the glass each of the seven layers seem about the same thickness, and at one part there are nine layers. This is the most remarkable example of

stratification that I have ever seen. The drawing is exact size.

In the latter case there had been no change in the iron mixture. The silicon was near 3.00 per cent. This was the only casting found in a heat of seventy tons. Such castings generally break in the tumbling barrels and are brought to me. For five years I made a standing offer of $10 to any molder who would at any time give me previous notice and then let me see him produce a casting gray on the outside and white at center, but every trial ended in failure. One day I told a molder near the cupola to make for me two flasks of test bars and pour them as soon as possible. They came out white at center and gray on the outside. I asked him how he did it, or rather what he did out of common, and he didn't remember anything. I had him try again and he failed, but the third time he succeeded. We found that he held his ladle (which had never had molten iron in its lining) for the iron that another molder had caught from the cupola in another just such a ladle, and this iron was one of the first three or four ladles that came down. The iron had boiled on the new cupola bottom and had boiled in two fresh ladles. Iron caught in two such ladles after eight or ten ladles had been taken or the first iron caught in one ladle would not produce the phenomenon, and sometimes for months no combination would produce it.

This is a peculiar specific condition attending melting that produced very remarkable results irrespective of chemical composition. Just a slight variation in the proportion of the irons in the mixture would make it impossible to produce these castings. Yet if no change was made there have been times when the number of such castings would increase.

This is not due to the irons composing the mixture not mixing, but is due to a peculiar condition of the melted iron. On entering the mold the cold surface of the mold brought the temperature of the molten iron to such a point that as it became solid it was gray. The temperature then changed to cause the next iron to set white, and then the next to set gray, and then the remainder in a very few seconds, if not in less than one second. The physical manipulation of melted iron and the conditions under which it cools, whether slow or fast, exert so much greater influence upon the physical quality of the final casting, that a chemist by analysis does not find enough conformity between chemical composition and physical quality to allow a determination of definite relations between them. But the founder can determine the physical condition by physical tests and can tell whether an increase or decrease of silicon would improve it.

Casting Aluminum.

Aluminium castings can be made in any ordinary foundry fitted for making brass castings. The crucible that should be used is a plumbago or black lead crucible, and the metal is preferably melted over a coke fire. If this is not convenient, however, a fire of charcoal, oil or gas can be used, and are desirable about in the order named, the great object being to use a fuel which is free from nitrogen, phosphorus and silicious gases. It is not advisable to use a fuel of either hard or soft coal, because of the fact that these fuels contain more or less of these gases, which, to a certain extent, will be absorbed by the metal and will cause blowholes.

After the metal is melted it should be removed from the fire and cooled down to the proper temperature for pouring it; generally speaking, it should be very little above the melting point, or when the metal is about a dark cherry red, although the exact temperature at which the best results can be obtained is a matter which can only be determined by experience.

In cooling the metal down to the proper temperature, this should be done by the addition of new metal, after the crucible of molten metal has been removed from the fire, but the metal should not be allowed to grow cold by standing, nor should it be allowed to stand any longer than is absolutely necessary. This cooling is done by stirring with a bar of new metal, or an old gate, or something of that sort, and it will be easy to see by the rapidity with which the metal that is added melts just how much it is desirable to add. After the metal is once started to pour a casting, it should be poured from the crucible rapidly, but at a uniform rate.

There is apt to be a certain amount of oxide of aluminum in the metal, and if a very fine class of work or a particularly good casting is desired, this oxide to a certain extent can be removed by the addition

of nitrate of potash to the molten metal, which is added in quantities of about one tablespoonful to one hundred pounds of aluminum, and in the following manner: After the pot of metal is removed from the fire, place in a sheet of writing paper which has been dipped in water, the nitrate of potash, and place this on top of the metal. Be prepared instantly with an iron rod, or something that will answer the same purpose, to

One of six Centrifugal Pumps made by the William Cramp & Sons Ship and Engine Building Co., of Philadelphia, for the New Orleans Drainage System.

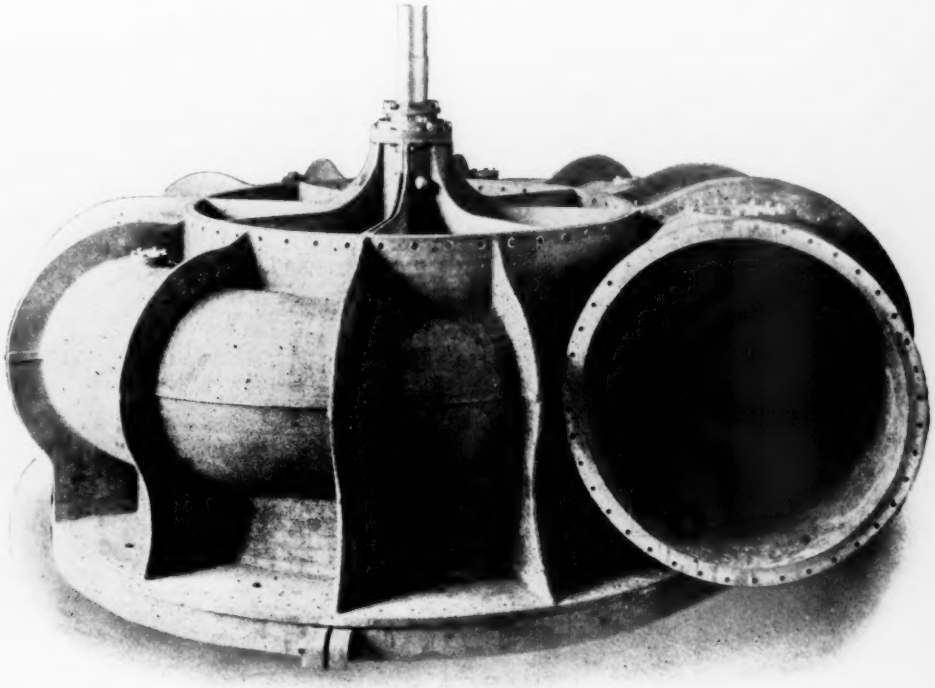
push this paper to the bottom of the pot. By the time it has reached the bottom, the nitrate of potash will come to the surface through the body of the metal, combining with the oxide on its way to the surface. The metal should be continually stirred so as to bring as much of it as possible in contact with the potash. It is best not to use too hot a fire for melting aluminum, for the reason that you are more apt to oxidize the metal than if it is melted gradually and slowly.

Castings can be satisfactorily made by the use of an ordinary sand mold, such as would be used for a brass casting, the only additional precaution which is necessary to take being that the mold should be thoroughly well vented, and also that it should have a larger gate and high riser. These points cannot be too strenuously insisted upon. The object, of course, is to allow as much of the gas to escape as possible, and it is more necessary in casting aluminum than any other metal to have a large gate and high riser, for the reason that the object to be gained is to have the metal in the body of the casting cooled before the metal in the riser, thereby allowing the

metal in the riser to flow in and supply the shrinkage as the aluminum in the body of the casting shrinks, and it is very much more necessary to have large risers in the use of sand molds than in the use of hot iron molds, where only small gates are necessary. As in other castings, of course, the finer the sand that is used in making the mold, the more perfect the surface of the casting. If these precautions are followed, the ordinary brass founder will have no difficulty in making successfully aluminum castings with but very little trouble and experimenting.—Alumium World.

eter and three feet 7¼ inches deep at the face, the suction nozzle being 6 feet in diameter at its small end. The pump casing is 33 inches in diameter at its small end, enlarging to 6 feet at its discharge end. The casing, which is spiral, has a mean diameter of 13 feet, its largest diameter being about 18 feet.

Working under a head of from 16 to 18 feet, this pump, operating at 75 revolutions per minute, will deliver 617 gallons per second, while at a speed of 80 revolutions this is increased to 1,056 gallons per second.



One of six Centrifugal Pumps made by the William Cramp & Sons Ship and Engine Building Co., of Philadelphia, for the New Orleans Drainage System.

Big Castings.

Our illustration shows one of the largest loam castings, in point of size, ever made in this country. It is one of the six centrifugal pumps made by the William Cramp & Sons Ship and Engine Building Company, of Philadelphia for the New Orleans Drainage System, now being installed in that city for the improvement of the sewerage there.

The runner of this pump is 9 feet in diam-

The Manufacture of Malleable Castings on a Small Scale.

It is a uniform law that the larger the output from a single plant the lower is the cost of production per unit. This is the case whether applied to a brick-yard, a sawmill or a steel works. In fact there are several industries, that it is impossible to operate commercially on a small scale. No one knowing his business would think of making rails in a one-horse way. We very often receive

inquiries from foundrymen who desire to manufacture steel castings for their own use. It is a hobby with some people to try and do things they cannot do. Steel castings cannot be made profitably on a small scale. Another branch of the foundry business in which adequate results are only obtained through operating on a large scale is the malleable industry. Small malleable plants like small steel works eat their own heads off and none are in operation. Mr. E. H. Putnam in a recent issue of The Tradesman takes a different view of the situation, writing as follows:

The chief difficulty in the malleable iron business is in marketing the product. And even this feature is not operative at the present time; for the demand is in excess of the supply. The question is: Will it pay a firm that uses a large tonnage of malleables to install a plant and manufacture them? The answer depends upon the class of goods wanted, and the amount to be consumed. If the product is heavy, like, for instance, car couplers, requiring the greatest possible strength, the iron must be melted in the reverberatory furnace; and with this system economy of production requires that three heats a day be melted, amounting to at least 15,000 pounds. And this would have to be kept up for a considerable period of time, because the first few heats would be sure to cost more than the market price of the product; indeed, if the business were placed on a paying basis within two or three months' time it would be quite exceptional.

But, if the class of product required is such as is used for general agricultural and similar machinery, wherein good malleables are quite as serviceable as the best, the case would be very different.

In the second instance, the cupola would be just as efficient for melting the iron as the reverberatory furnace. Twenty-five years ago excellent malleables were made of cupola iron, and even to-day much of the light malleable is cupola product. It should be borne in mind also that knowledge of iron chemistry is now very far advanced from what it was twenty-five years ago. Then, and even at a much later period, the iron from certain districts, or from some particular blast furnace was supposed to be all right for the purpose, and it was not at all common to refer to chemical analysis. The iron had to be of the charcoal brand, and of such grade (judged wholly by fracture), as to insure total combination of the carbon in the casting produced. If good malleables were customarily made under these conditions, how much better must be the product to-day, since we have learned the exact chemical content required, and have but to specify in order to get from the blast furnace just what is wanted.

Where malleable castings are manufactured on a large scale, a chemist, or analyst may be employed at the foundry with profit. But the analysis furnished by the blast furnace is generally reliable, and if this is taken advantage of re-analysis is unnecessary.

In order, then, to add the manufacture of malleable castings to any iron foundry business, it is simply necessary to build annealing ovens, and to employ a superintendent who knows how to do the business. The former is a mere mechanical operation that can be performed anywhere and at any time. As to the latter, if you cannot find a suitable man who you are sure knows how, why, you had better make a present of your surplus capital to some deserving charity; you get rid of it a little more quickly, but not more surely.

The man who is to superintend the malleable department should be a thoroughly practical founder, in grey iron as well as in malleable, and thus the cost of superintendence would not increase beyond due proportion to the increased product.

Assuming then that you have a superintendent who understands the whole business, including grey and malleable iron founding, and the annealing processes, and an annealing oven, the latter at a cost of about $1,000, you will be ready to go into the manufacture of malleable castings.

No extra cupola will be required, as the iron for malleable castings will be melted at one and the same heat with the grey iron.

In manufacturing malleables on a small scale, the cupola affords very great advantages over the reverberatory furnace; for, in conjunction with the grey iron, you can melt a heat of one thousand pounds of iron for malleables at practically no greater proportionate cost than if you were to melt ten thousand pounds or more. This would give a product not to exceed five hundred pounds of malleable castings; for, at least half of this would be run into annealing pots, sprues and "over iron;" that is, surplus iron, that always attends the casting process. It will be seen, therefore, that a very small business in malleable iron can be conducted in conjunction with grey iron founding without much extra cost.

To reduce any kind of business to the greatest economy it is necessary that it be continuous, so that all hands may become accustomed to the work, and thus, what was difficult at the outset, will come to be easy and simple and errors of to-day will be corrected to-morrow, a thing that, for obvious reasons, would be impossible, if long periods of time were to intervene between operations. The same molders who do the grey iron molding would, in many cases, do the malleable iron molding also; so that, in the course of a few weeks, the foundry department would be running as smoothly as before the malleable business was added.

The annealing process cannot be conducted as economically on a small scale as on a large one, the principal difference being simply in the cost of heating the annealing ovens. It requires, say, two days' firing to get the heat of an oven full of castings up

to the annealing point. In large concerns, when the annealing process is completed, the oven is emptied and refilled at once, and so the heat that remains in the brick work of the oven is utilized. But this saving, divided into 24,000 pounds of castings, would not amount to very much per pound.

To conclude, I should say that the firm that uses at least two hundred tons of malleable castings a year can make them more profitably than to buy them—if it knows how.

Even in agricultural and similar machinery we do not believe good malleable is as serviceable as the best. The manufacturer of agricultural implements who should undertake to use good malleable in his product instead of the best would likely soon find that the farmers did not enjoy sending for repairs. That his trade would ultimately suffer is assured.

If the cupola is as efficient for this class of work as the reverberatory furnace it is indeed strange that manufacturers of malleable castings should discard it and install the latter with its higher rate of fuel consumption. Such action must surely have been dictated by experience.

Then, as to a superintendent who understands his business, he will be more difficult to obtain by amateur malleable manufacturers than the thousand dollar annealing oven Mr. Putnam recommends. Men who know the malleable business alone, not to talk about those who are competent to handle grey iron at the same time, are very scarce and command a high salary. It takes as much ability to turn out five tons of malleable castings a day as fifty. Assuming that a firm uses two hundred tons of malleable castings a year a salary of $1,800 per year to a superintendent would add a charge of nine dollars to each ton of castings produced. From this item alone those who are about to embark in such a venture may form an idea as to how much money they would be likely to save by making their own malleable castings.

The Warping of Castings and the Remedy.

While I was a young apprentice a casting made by a middle-aged journeyman on the next floor came out so crooked that the proprietor, after condemning it, asked the molder what caused the crook, the pattern being straight. He could not explain it, and merely said: "They come that way sometimes." The foreman was questioned on the subject, but he was incapable of scratching a theory out of his hair, and to this day, after over sixty years, I have found very few molders who are able to correctly explain a case of warping.

On hearing the conversation referred to I was strongly impressed that the craft was deficient in an item of useful knowledge, and I immediately set to work to find a satisfactory theory, and in a few minutes I

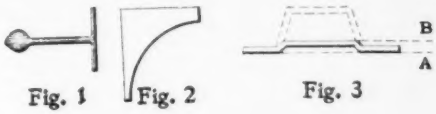


Fig. 1 Fig. 2 Fig. 3

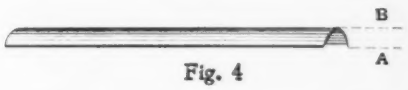


Fig. 4

Fig. 5 Fig. 6

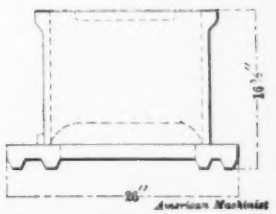


Fig. 7

arrived at what I claim to be the true explanation of the warps or crooks which occur in certain castings where inequality of thickness and other circumstances cause unequal time of cooling, not unequal shrinkage. They generally warp contrary to what would be produced by unequal shrinkage.

Finding molders generally without any definite ideas on this subject, my practice was—through forty-five years of almost continuous foremanship—to give molders definite orders how to treat the casting in each case, and watching the result very closely. It was a good school for me. It is well known that cast iron becomes shorter in proportion to the rapidity of its cooling, which would make the thin edge of a rib or flange cast on one side of a thick plate the hollow or concave side; but on examination it will be found that the reverse is almost universally true. The paradox will be cleared up later. A plate 3-16 inch thick,

6 inches wide, 10 feet long was found to have shrunk 1⅜ inches full, that is, one-eighth over the average, and that eighth means much in crooking a casting.

A strange feature of warping at first sight is that the nearer the two contending lines approach each other the greater will be the warp. For example, a lintel or flanged plate with 2-inch light ribs will warp more than a lintel with 12-inch ribs. Such a statement strikes the average mechanic with astonishment, but it is nevertheless true in fact and reasonable in principle.

To illustrate, take a board 2 inches wide and 10 feet long, saw it in two in the middle, bring the cut ends together on a table in such a position that they will touch at one edge and at the other edge will stand apart ⅛ inch, and the two outer ends will be found out of line with the center 1⅞ inches, or 30-16, the length of each board being thirty times the width, and having moved from the point of touch just 1-16 inch. Take another board of the same length, but 12 inches wide, manipulate in the same manner, separating one edge ⅛ inch, and the ends will then be found out of line with the middle only 5-16 each, a difference of 6 to 1, the exact difference between the widths of the two boards.

The distortion by stretching and upsetting occurs in the whole length of a casting, while in the board illustration it all occurs at one point—the saw cut; but still it correctly illustrates the principle on which the crooks are produced, and also why so many different degrees of warp are experienced.

When irregular castings are found straight they show a distortion equal to the difference in shrinkage in the different parts, which does occur in a few cases, but the distortion is generally so great as to throw them out of line in the opposite direction from mere shrinkage warp.

I have found a number of cases where great perfection of line was soon obtained by using the watch, and varying the time of throwing off the cope until the exact time was hit. Fig. 1 is a T-bar for supporting pavement "glass plates," about 4 feet long by 7 inches deep. Fig. 2 is a bar 10 inches wide by 6 feet long, used in paper mills; although quite irregular in thickness they both came out straight when unloaded at the proper time, which can only be accomplished on short castings able to lift themselves.

Take a bar of wrought iron, say, ½ inch thick, 3 inches wide by 10 feet long; heat it to redness, then suspend it by two pair of pincers, letting one edge settle into a body of water ½ inch, when the cooling and shrinking of this lower edge would immediately warp the bar an inch or more. If the bar should then be cooled it would gradually assume its old straight line, because it would be free to move out of line under its variation of temperature, and would not be distorted by restraint.

Reheat the bar and clamp one edge to a stiff beam, at several points, by stirrups, to allow slipping endwise, then dip the other edge in water as before until it is blackened, then immediately unclamp and leave the bar to cool as before, and it will be found to have undergone considerable distortion, leaving the cooled edge permanently longer than the opposite edge, which constitutes a warp. Precisely in the same manner are the crooks produced in castings irregularly cooled under the confinement of mold and flask.

Calling this distortion either upsetting or stretching of the different parts gives a fairly satisfactory theory of the warp, but a closer reasoning suggests that it is mainly a forced readjustment of the metal between the two contending extremes of fast and slow cooling lines, and that the thick, concave side of a crooked casting need not necessarily be the shortest side to become the concave side.

It is not supposable that the fast cooling top of a lathe shear can force the slower cooling bottom, as molded, to move with it. If someone, casting long lathe shears, would test the shrinkage, top and bottom, by laying on the pattern, and report, it would be very interesting reading; it would probably show very little deviation from common shrinkage of such thickness.

The annexed figures, 3, 4, 5 and 6, show end views of such forms as exhibit great tendency to warp. The lines of rapid cooling, marked A, and the lines of slow cooling, B, will be found to lie nearest together in all cases where the tendency to warp is the greatest. Fig. 3 is a panel plate for a building column. It warps much; but if the panel was several inches deep, as

shown by the dotted lines, the warp would be much less.

Fig. 4 is a pavement gutter, the pattern a full ⅛ inch thick and 8 feet long. It had the top side, as molded, convexed ⅞ inch, which brought the castings exactly straight, hundreds of them. Fig. 5 shows the end of a section of a steam cylinder jacket, a warper.

Fig. 6 is an end view of a furnace angle iron, well known to jobbing molders as a warping casting, but to a less extent than the other samples, the extreme lines being farther apart.

My straightening practice has been to turn the flask on its side five to ten minutes after pouring, and, commencing 2 feet from the end, to strip every alternate bar space to about one-third of the distance from the top ridge. If they come concave on top, strip more; if convex, strip less; the object of stripping being to stretch.

The four sketches, Figs. 3, 4, 5 and 6, may all be called plates. The dotted lines A are on a line with the fast cooling edges of the plates, while the lines B are on the lines of the slower cooling middle of the plate, and, in all cases, the slow cooling and least shrinking line will be found the concave side, or reverse to shrinkage warp.

A correspondent asks why a lathe shear 12 feet long comes out concave on the top side, as molded, while a bed 24 feet long comes out concave on the bottom side, and makes a strong plea for light on the problem. They were overcoming the trouble by bending the pattern to suit. The explanation is a very simple one: In the 12-foot bed the shrinking top iron, after a little stretching, becomes strong enough to lift that 6 feet of bed, and gets most of its extra shrinkage; hence, concave on the top; but in the 24-foot bed, with a greatly increased load and twice the leverage to overcome, it failed to lift it, resulting in a distorted casting and a concave bottom.—R. D. Moore, in American Machinist.

Milwaukee Foundrymen.

A portion of the Northwestern foundrymen attended a theater party, trolley ride and banquet under the auspices of the Milwaukee Foundrymen's Association on the evening of November 16. Judging from the following invitation, there are not many Democratic melters of pig iron in Milwaukee:

The clouds of depression having dispersed, the light of good times again brightens the business world. The old song will be sung, "Hard Times Come Again No More." "Employment seeks labor, not labor employment," and so like silicon in the pig it is good.

In a spirit of praise and thanksgiving that King Iron is ruling, our foundrymen for this blessing and this, that Pres. Wm. McKinley has exceeded our expectations, again on account of a harmonious feeling that prevails among the foundrymen of our city, we will invite a few friends together with ourselves to participate in an entertainment, luncheon, and discussion. You are invited. We have a vacant chair for you. Will you join us? Do not disappoint us, but come.

Read the Shop Rules:

1st. No sour beer used in your cores.
2nd No rushing of the can.
3rd No beer during working hours.
4th Smoking allowed.

All will remain until the flasks and molds are dumped. Whistle blows at 1:00 a. m.

The Milwaukee papers took the view that a conspiracy was in process of formation, and came out with scare head lines, "United to Down Labor," "Northwestern Foundrymen Plan a Combine Against Labor," and other expressions calculated to arouse public interest.

Industrial Armies.

The number of men employed by individual companies may convey some idea of the responsibilities that rest upon those who direct their movements. It is stated that the National Tube Works employs 18,000 men; the Federal Steel Co. 22,000; and the Carnegie Steel Co. and the Pennsylvania Railroad Co. could likely go considerably higher. That managers of such concerns receive high salaries should excite no criticism. They earn them.

Upstairs Foundries.

At the Pittsburg meeting of the American Foundrymen's Association, C. J. Wolff, of the L. Wolff Mnfg. Co., Chicago, read a paper showing some of the advantages of having foundries located above the first floor. The Moline Plow Co., of Moline, Ill., have recently constructed a new foundry, and we reproduce the following description thereof from

a local paper, which shows that much unnecessary handling of material may be entirely done away with, by proper shop construction:

The finest foundry in Moline—that of the Moline Plow Co.—is almost completed and will be ready for occupancy by the first of next year. All that remains to be done is some interior finishing and the equipment of the floors with benches. It is the first second story foundry building in Moline and is a model shop throughout. It is light and airy and will make comfortable quarters for the men.

It is built of brick in the most substantial manner and no pains or expense have been spared in its construction. The second story, which is the foundry proper, as stated above, has a floor space of 150x175 feet, and will furnish accommodation for 75 molders, and nearly every man will have a window at his floor, which will give abundant light. The space in the center of the room is taken up by the stairs, at one side of which is located the elevator and cupola, all iron for the latter to be taken up the elevator. At the side of the room the core ovens are located, and these are models of convenience in construction.

One big advantage of having the foundry on the second floor is that gravity will then do much of the labor in handling the castings. After these castings have been taken out of the sand they are dumped into chutes, opening in the floor, which carry them below to the rattling room, where they are delivered upon a long platform extending over two parallel rows of twenty-one tumbling mills. Over each mill there is a chute, through which the barrels are charged. When the castings have been finished they are dumped onto the floor and rough edges ground off at five emery wheels, and then the iron is again shot downward and wheeled through a tunnel under the street to the departments where it is used. The system of fans by which the dust is taken up from these tumbling mills is claimed to be perfect in taking care of the flying dirt.

Great Scheme.

Martin Dennis Currigan has a new scheme which he intends to run in connection with the new municipal water plant. It is his intention to get the Boston capitalists who are going to build the plant, according to the plans of Currigan, to put up a large iron foundry in Denver and make all the pipe and other iron fittings necessary for Denver right on the spot. Mr. Currigan has discovered that there is a great deal of iron in the sand of Cherry creek and he intends to use that in the manufacture of his pipe. His scheme is very complex and he is almost as enthusiastic over it as he is over the vote on the bond issue.—Denever (Colo.) Times.

A Gentle Hint.

In the envelopes containing the wages of the employes of the McShane Iron Foundry last week was the following notice: "More work is expected from your floor; please hustle accordingly." The plant is situated at Dundalk, Baltimore County. For some time the manufacturers have been very busy, and the demand has been made upon the workmen in order to get back orders finished.—Baltimore Herald.

New Hampshire Doings.

Among the recent improvements at the Nashua Iron and Steel Company's works, one which is attracting particular attention is a large cast steel anvil to be used under one of the gigantic trip hammers. The die referred to weighs 8 tons or 16,000 pounds, and is one of the largest single castings ever made in this State. It was cast in Manchester. To handle the ore needed for the die it is necessary to procure a new five-ton ladle, which was made for the purpose in Detroit and on improved patterns. The iron needed to fill the mound filled the eight-ton cupola and was worked under the guidance of Mr. Algernon Quigley, formerly of the Birmingham (Eng.) iron works, but who for something over a year has been connected with the works in that city. He brought down the metal in fine shape, and when the casting had cooled off it was found to be perfect in all particulars and of fine texture and great tensile strength. The flask in which the casting was made was of six tons weight and was made also on improved lines.

The whole work of making the die was most anxious, for had anything gone wrong there would have been an almost total loss to the firm of what the casting cost in itself, a sum amounting to between $400 and $500. —Lowell (Mass.) Sun.

Making Stove Covers.

A correspondent writes us that he has difficulty in making stove covers, owing to the molding sand in his part of the country, which leaves the casting with too rough a surface if used alone. When facing is used and the patterns are printed the face of the castings will be marked as if something in the sand had melted and run away on the approach of the iron. We will thank our readers to advance their theories as to the cause of this, as well as to suggest a remedy.

Light Brass Founding.

When I learned the trade of brass founding I served my time in a shop that was connected with a large engineering establishment, and so the work was what might be called heavy. When I left that shop I naturally gravitated towards shops producing a similar line of work; and so for a number of years that was the only class of brass work in which I had experience. I acquired a kind of contempt for small work, and disparagingly called it "chicken feed." There came a time when I became connected with an establishment which had to make considerable quantities of that chicken feed in order to get the heavier class of work they wished to make their specialty. Then I discovered I had much to learn before I knew my trade thoroughly. Other people were turning out that class of work at prices and of a quality we could not imitate; so our customers were anything but satisfied. The castings we were making were too rough and were devoid of that nice orange color they should have had. We put good metal into them, but on account of the color our customers would not believe it, for in this case appearances are everything. The consequence was that our light work left us, a thing that we deplored only because we could not get enough of the heavier work to keep us busy.

We ultimately, of course, solved the problem; but in doing so I discovered that the light work which I had so despised required knowledge of a special character, and that the materials and methods employed on heavy work were unsuited to the production of fine light castings.

As might be expected, the sand is the most important factor in the case. When sand of a coarse grade is used in the molds the grains, being large, do not pack close together, but leave small interstices between, into which the metal enters, giving the castings a coarse, file-like surface, which is not particularly noticeable on large castings, but shows up bad on small ones. In shops where all the work is of a heavy character it would scarcely pay to give shop room to a fine grade of sand, as it would only be used occasionally, when such work as name plates had to be made. These castings, however, can be turned out very nice and smooth in the coarse sand by using a facing composed of equal parts of old and new sand, to every twenty parts of which one part of flour is added. This facing, however, cannot be expected to take the place of the specially prepared fine sand on all-round light work. This class of sand can be procured from any of the dealers in foundry sands. It is often called "brass" sand, and in the Western country a great deal of it comes from around Zanesville, Ohio.

Another important item is, of course, the shop equipment, such as flasks, boards, etc. The flasks ought to be interchangeable, and the pins should fit perfectly, as, if there is any shifting it is almost impossible to obtain a good "lift," and this is indispensable to good work. Plenty of boards should be provided, as they are used on the cope, as well as under the nowel. The cleats on these boards are in many brass foundries nailed across the ends, the same as on a drawing board. They can then be used indifferently on cope or nowel. The absence of the usual cleats makes it better in "weighting up," as the weight will rest flat on the board wherever placed.

Suppose we have got a "side" of loose, light jobbing work and we are going to commence molding. In arranging our patterns on the match, or follow board, as the case may be, we place the lightest ones at the end of the flask, farthest from the sprue, and the heavier ones near the sprue, because, the flask being inclined while pouring, the metal rushes down the runner and fills the vacancies at the bottom first. Another important thing in placing the patterns is to arrange them so that they can be gated at the end that is nearest the sprue, as this is the highest point of the casting when the mold is elevated, so the

metal runs down hill all the time that it is filling the mold. The practice of using boards on the cope is not followed in all foundries. In such cases a perfectly true and smooth board is bedded on each cope before it is lifted off, and the weights used to hold down the same when pouring are wide enough to reach across the flask, and should be flat, so as to have a bearing on the sand. This practice, of course, saves one-half the boards that would otherwise be necessary, and is satisfactory, provided the smooth boards and the weights are true. If the board is warped and is bedded on the copes in that condition, the weights will bear too much on some places and not at all on others, and some of the castings will be strained and others will not "run," simply because in the one case the pressure of the metal will force up that part of the mold where the weight does not touch, and in the other the weight will press down that part of the mold on which it bears too heavy; so that, all things considered, I prefer the use of boards on the cope for very light castings, because each mold, having its own board properly bedded on while the patterns are in, and the same board being kept on during casting, the chances of loss from the causes above mentioned are reduced to a minimum.

Castings may be strained from other causes than the ones just mentioned. The upward pressure exerted against the cope by the metal at the moment of pouring is very great, and few foundries have their weights heavy enough to resist this pressure, and if we place on more than one weight their height will interfere with the proper pouring of such molds, as they are almost universally poured with the "side tongs," the lip of the pot being rested on the edge of the flask. The office of the weight in this case is rather to hold down the cope after it is poured, and not while being poured; the foot of the molder performs the latter service. If we watch a molder pouring off we will notice that he does not remove his foot immediately after filling a mold, but lets it linger there until he has commenced pouring the next mold, and so makes sure that the pressure has been so diminished by solidification that the weight will be sufficient. Failure in this particular will also result in strained castings, and will swell the scrap pile, as no fins are permitted on light work.

Fine sand will produce fine castings, and it is surprising what beautiful work can be made when we are provided with this most important requisite; but even fine sand will adhere to patterns if something is not used to prevent it. The best thing that can be obtained for this purpose is lycopodium, an impalpable yellow powder, obtained from the clubmoss. It is expensive, but it pays to use it, and some founders running all fine work use nothing else for parting. Others, again, think it is too expensive a thing to be used in a foundry, and generally it will be found that these people are so ignorant of the practical part of their business that they never discover they are throwing away dollars to save cents.

So we have fine sand and also lycopodium, and now we want fine metal—that is, metal that will "color" well. Here is a recipe for such a mixture: Copper, 16 pounds, and a pound each of zinc, tin and lead. This is called ounce metal, because there is used an ounce each of the four metals to a pound of copper. For extra fine castings we can decrease the lead and zinc by one-fourth.

The class of work we have been considering is supposed to be very light and fine, and if the materials, methods and metal are as suggested, and the castings are allowed to cool in the molds, they ought to come out both smooth and with that nice color which, as before mentioned, is so desirable.—C. Vickers in American Machinist.

The Distribution of Phosphorus in Metal.

Mr. G. H. Clamer, chemist of the Ajax Metal Company of Philadelphia, sends us another communication about the distribution of phosphorus in metals, this last letter being supplementary to an article we printed in a former issue on the same subject. Mr. Clamer writes as follows:

"We have noticed in your September number, in an article relative to the use of phosphorus in bronze, a statement made in refutation of some remarks we made on the subject in a previous issue—our statement being to the effect that phosphorus is never homogeneously distributed when present in the copper, tin and lead alloy, no matter who may be its manufacturer, or how it has been treated.

"The writer evidently did not comprehend the point we made. We did not mean to say that phosphorus is not distributed in such a manner as to appear in the same proportions in all parts of the casting by chemical analysis, no matter how small a portion be taken for the purpose. We do maintain, however, as we stated in a previous article, speaking of microscopic examination, that the phosphorus is localized in the 'eutectic,' or that part of the alloy which last solidifies, the cementing material of the alloy.

"Although the microscope will never be able to isolate the molecules of matter for examination, yet it does reveal to us many things not fathomed by chemical means. Take as an instance the lead in this alloy—by chemical analysis it may show exactly the same proportions in every part, but the microscope of sufficient power will at once show its distribution to be in trails and pools, scattered here and there throughout the mass.

"We are not speaking now alone of our own observations on the distribution of phosphorus in bronze, but we take the liberty of quoting M. Charpy of France on this point. (Metallographist, Vol. II, No. 2, p. 144). M. Charpy is perhaps the leading authority in Europe on the microscopic examination of this class of material. He said:

" 'Phosphorus when present in bronzes seems to be localized in the eutectic alloy, modifying its hardness, but not its mode of distribution. The eutectic alloy is always relatively harder and much stronger than pure copper, on acount of the presence of the compound of copper and tin; it is this alloy which regulated, to a great extent, the compressive strength of the mass, which is the greater, the greater the proportion of the alloy, i. e., the richer the bronze in tin.'

"It is undoubtedly the fact that phosphorus is localized in the eutectic, or it would be impossible to have an alloy containing an excess of phosphorus show oxide spots. It is not a difficult task to incorporate phosphorus in an alloy to show even distribution by chemical analysis. The phosphorus needs simply to be added, and it will distribute itself. We seriously doubt if any chemical treatment of the alloy will cause the phosphorus to go to any other part of the alloy than eutectic.

"The phosphides of the metals are relatively so much more fusible, or have a so much lower freezing point, that it is but natural to suppose that they would be found in the part which has solidified last."—Aluminum World.

The Diamond Drill Centers.

We illustrate herewith a new and useful article in the way of a Drill Center, manufactured by the Diamond Clamp & Flask Co., of Richmond, Ind.

These Drill Centers, if used by the pattern maker will obviate a source of trouble in the foundry, and especially in the machine room, of having part of the centers in castings blank, as it is almost impossible for a molder to patch up a small drill center, if it fails to lift. These centers are made of

brass and highly finished, and of a shape that will insure a perfect lift.

The center is easily put into the pattern by boring a 3-16-inch ho eland driving it in. They can also be used in metal patterns, by drilling a 3-16-inch hole and counter sinking with a ¼-inch drill.

There is also a small center in the center of these centers for a pair of dividers, therefore, the center can be driven into the lumber and the boss scribed afterwards. It will only be necessary to do this when the boss is so small that there is danger of splitting the lumber. Samples will be sent by the manufacturers to anyone interested.

The Haydenville Co., of Haydenville, Mass., has issued a new special supplementary catalogue of plumbing and steam, brass and iron goods, including valves, faucets and the like. This small book contains many of the newer articles of the trade and is supplementary to the standard catalogue of the Haydenville Co.

Out of Business, into Politics.

We recently made inquiry concerning an eastern foundryman, our letter being returned with the above remarks. These few words convey a volume of information and account for several people failing to make money out of the foundry business.

Deaths.

John D. Wright, formerly operating the Hecla foundry, died at Pittsburg November 25.

Thomas W. Saben, a former foundryman of Hinsdale, N. H., died in that city recently, aged 65.

Mr. Patrick Dillon, for many years assistant foreman in the National Malleable Castings Company's foundry at Indianapolis, Ind., died Dec. 4, of typhoid fever.

Gen. Thomas W. Hyde, who for nearly forty years has been a leading factor in the industrial activity of Bath, Me., died at Fortress Monroe, Va., November 14th. Gen. Hyde was the son of Zina Hyde, of Bath. He was born in Florence, Italy, January 15, 1841, was educated in the schools of Bath, and was graduated from Bowdoin College and Chicago University. In 1861 he organized a company of the Seventh Maine, was immediately elected major, and in the absence of the colonel and lieutenant colonel he took the regiment to the front. At the close of the war he returned to his home in Bath and became the proprietor of Hyde's foundry, so called, and there carried on the business of manufacturing windlasses, pumps, capstans and other pieces of ship machinery. Finally he took what was then the Bath Iron Works or to be more correct, the Goss Marine Iron Works, and there he built marine engines and ship machinery with much success.

In later years he organized the Hyde Windless Co. Through his energy the Bath Iron Works has become well known as a shipbuilding concern, having constructed several vessels for the United States navy, besides filling private contracts for merchant steamers.

George F. E. Holmgreen, founder of the Alamo Iron Works at San Antonio, Texas, died in that city November 7.

Charles Kelly, secretary of the Kelly Foundry and Machine Co. of Goshen, Ind., and one of the founders of that concern, died in that city November 9, aged 46.

Pneumatic Tool Litigation.

Most every useful invention placed upon the market has brought forward a number of notable suits for infringement. The Chicago Pneumatic Tool Co. advise us that they have recently secured decisions in their favor against several concerns infringing upon their patents.

It Didn't Use to be That Way.

The Mahoning Foundry and Machine Company is at present operating its machine shops double turn to meet its orders. The company is in need of several good molders, but is unable to secure them. The W. B. Sennett Company also reports a scarcity of mechanics in that line.—Youngstown (Ohio) Telegram.

Casting Block-Tin Tubes.

Of the inventive ingenuity of Eli Whitney, the famous inventor of the cotton gin, Professor Silliman, in some reminiscences published in 1846, cites several interesting examples. In the summer of 1808, for instance, he tells, Whitney was applied to for tubes of block tin, for the purpose of drawing through an innocuous metal the soda water, highly charged with carbonic acid gas, which was then just beginning to be known. Lead and copper tubes were rejected on account of their poisonous properties, and there were then no facilities in the United States for constructing the tubes that were desired. Whitney accomplished the object, with his usual precision. The tubes were required to be many feet long, and strong enough to resist a heavy pressure. He caused a mold to be constructed of cast brass, in two parts, each containing, for about two feet in length, one-half of the cylindrical cavity corresponding to the desired tube. When the parts of the mold were accurately fitted and screwed together, they contained the entire cylindrical cavity between them, and to secure the duct through the tube a polished steel rod, of the proper size, and made very slightly tapering, was fixed in the center and the melted metal was cast around it; the rod, being terminated by a ring, was easily knocked

out. The separate parts of the tube, thus produced, were then joined into one, by having the contiguous ends of two of them brought longitudinally into contact, and included in another mold, containing an enlarged cavity, into which melted tin was poured. The duct was preserved by a steel rod passing through it as before, and thus the joint was perfected by a knob of metal which at once united the two tubes into one, and gave them great additional strength. Whitney did not state that this method was original, but up to that time there had, so far as known, been no similar method of casting block tin tubes.—From Cassier's Magazine for December.

Attracting Attention.

Something has been said in the last few issues of THE FOUNDRY about advertising. Some people call advertising a science, while others pronounce it a lottery. After all is said the fact remains that money can be wasted here as anywhere else.

Much of the printed matter that comes to us could be increased a hundredfold in effectiveness by having ten per cent. more attention paid to it before it reached the printers' hands. Then again there is plenty of evidence that some people like to have their printing done as cheap as possible. The result is that they get a cheap job, where a good one could have been had for a few dollars more. This kind of economy should be tabooed along with other kinds of saving which keeps the cent and lets the dollars go.

We are reminded of these things by a small booklet which has reached us from the Carborundum Co., of Niagara Falls, N. Y. This concern makes abrasive wheels; most people would call them emery wheels, and we used to do the same thing until we were told that all abrasive wheels are not emery wheels by a long shot.

But returning to the subject of advertising, it is the way the Carborundum Co. tells its story that appeals to us rather than their product. An abrasive wheel or an emery wheel seems to be a sort of a dead subject anyhow to talk about, and yet the Carborundum Co. has managed to infuse considerable life into it and produced a booklet about it that gives one a lot of interesting information in a palatable manner. To show how entertainingly they have handled the advertising of their carborundum wheels, we quote some extracts from their booklet, which may serve as a model for others who advertise, and at the same time prove useful to people who have to do with the grinding of different materials:

ECONOMY VS. CHEAPNESS.

"One of the mechanical journals recently published an article to the effect that in many concerns the superintendent, in ordering goods, called for the highest grades which he thought the purchasing agent would buy, while the purchasing agent bought the lowest-priced goods which he thought the superintendent would use.

"It is the common experience of all manufacturers that many buyers will consider nothing but the matter of first cost, absolutely ignoring the question of real worth.

"The comparison may seem to be an exaggeration, but the question of selection between the pen and the typewriter is really the same in principle as the relative worth and selection between 'low-priced' and 'high-priced' machinery in other lines.

"A good typewriter costs about ten thousand times as much as a steel pen, and yet a great many typewriters are sold.

"A typewriter outlasts thousands of pens.

"A typewriter does so much faster work, that not only is labor saved, but work is accomplished by its use which could not be done at all with the pen.

"And then the work is better done.

"More work, faster work, better work overcome the difference between one cent and one hundred dollars.

TRUE ECONOMY IN MANUFACTURING.

"The selection of economical abrasives in the matter of shop grinding and polishing has received comparatively little attention, probably because the cost of grinding materials is a small item as compared with other shop expenditures. And yet, *it is a fact that every manufactured article is either ground into shape or is fashioned by tools which have themselves been ground into shape.*

"Grinding is the fundamental operation in all manufacturing, and economy in grinding is economy at the foundation of all shop practice.

WHAT CONSTITUTES ECONOMY IN AN ABRASIVE WHEEL.

"The LIFE of an Abrasive Wheel is not measured by the number of months it lasts, but by the amount of work it does before it wears out.

"The EFFICIENCY of an Abrasive Wheel is not so much measured by the amount of work it does during its life as it is by the amount of work it does in a given time—for this reason: *The wages of the man who operates it amount to more than the cost of the wheel itself.*

"The ECONOMICAL VALUE of an Abrasive Wheel consists in a well balanced combination of the above mentioned properties, i. e., long life and rapidity. Add to these, clean work, ease in operating and safety and we have the truest economy in abrasives.

CARBORUNDUM IS THE IDEAL ABRASIVE.

"Carborundum is a manufactured substance which is being used for all purposes where emery and corundum were formerly required. Its sale is being effected in largely increasing quantities on the demonstraed proof of our broad claim that Carborundum is the *most economical* abrasive material known.

WHAT CARBORUNDUM IS.

"It is a material made from a mixture of coke, sand and salt, fused in the tremendous heat of an electric furnace.

"The substance thus produced, takes on cooling, the form of crystals of great brilliancy and exceeding hardness and sharpness.

"The name 'Carborundum' is formed from 'Carbon,' which enters largely into its chemical composition, and 'Corundum,' the abrasive characteristics of which are surpassed by Carborundum.

"Carborundum is, with the *possible* exception of the diamond, the hardest substance known.

"It is harder than emery and harder than corundum.

"It is sufficiently brittle to keep the cutting surface always fresh and sharp.

"It weighs less than emery—in grains and powders there is more of it to the pound, and wheels made of it are lighter than emery wheels.

"It is this hardness, sharpness, brittleness and lightness that renders it absolutely the best abrasive known.

CARBORUNDUM IS CHEAP, BUT CARBORUNDUM IS NOT LOW PRICED.

"The first question asked by a prospective purchaser of a Carborundum Wheel is, 'How much lower in price is it than an emery wheel?' And when the answer comes, 'It is not lower, but considerably higher in price than emery,' some men will listen to nothing more. It costs more than the old-style grinder, and that settles it.

"If a Carborundum Wheel was simply 'just as good' as an emery wheel there certainly could be no reason for its purchase at a higher price, but Carborundum Wheels *are* purchased and in constantly increasing quantities."

If this does not tell all there is to be told about Carborundum, it at least covers the main points. We have reprinted this much of the text of the Carborundum booklet as an example of how things may be put together so that they will attract attention. The knack of doing so is something the majority of advertisers have to learn.

A Series of Accidents.

Benjamin Reed, an employe of the Walter R. Grant iron foundry of Newfields, sustained a serious scald the other morning by stepping into a vat of hot water while attempting to escape molten iron which was escaping from a flask. The workmen were in the act of pouring off a big pillow block which would weigh nearly six tons when completed. It is the largest casting that the company has molded for years. Clarence Thompson was also burned by the iron, but his injury was not serious. It was fortunate that a conflagration was averted, as the molten iron flew at random about the building. —Nashua (N. H.) Telegraph.

The big cupola at the Michigan branch of the American Car & Foundry plant at Clark avenue blew out yesterday afternoon, and a number of their employes at work in the immediate vicinity were severely injured by the fiery cascade of hot cinders. Dr. Robert L. Kennedy, who was called by the foundry authorities, found that John Gudzick, 755 Twenty-third street, and Robert Boscabish, 154 Twenty-third street, were so seriously injured as to necessitate treatment at Grace hospital. Injuries to the eyes are the most serious in both cases.—Detroit (Mich.) Journal.

A large mold in the foundry building of the Atha & Illingworth Steel Works in Newark broke yesterday, just as it had been filled with molten steel to make a base plate for the new East River bridge. A dozen men were standing around the flask, and another was perched over it manipulating the ladle from an electric crane. Flames gushed out in every direction from under the broken mould, and six men and a boy on the ground were more or less seriously burned about the face, hands and chest, while the man on the traveling crane was almost roasted before he could be drawn out of the way.—New York Sun.

A terrific explosion occurred at the Fort Pitt foundry, of Mackintosh, Hemphill & Co., at Twelfth and Aetna streets, last night. Three men were injured, and a corner of the foundry was badly wrecked. Two of the men are in the Homeopathic hospital, and are not expected to recover.

August Lang, who had charge of the crane, and was in the cage twenty-five feet above the molder's flask containing the cast-

ing that blew up, had a most thrilling experience. He jumped through a window, head foremost, landing in the middle of the street. In addition to his burns, he is badly cut and bruised by his fall, and it was stated at the hospital last night that there was little hope of his recovery.

The accident happened about 8 o'clock. There was a number of men working immediately about the flask at the time. Lang was working the traveling crane that carried the hot metal to the huge cylinder, about seven feet in diameter and six feet high. White was guiding the ladle, while Warden was assisting him. The flask was buried in the ground to within a foot of the top. The casting was almost complete, several tons of molten metal having been poured into the receptacle. The work had just reached a critical stage, and the men were working with all possible speed to finish the casting. While they were pouring in the last ladle of metal, without any warning, the explosion occurred. Molten metal was thrown in all directions, while the men were enveloped in a blinding flash of gas as it blazed up to the top of the building. White and Warden were thrown through the air, landing about twenty feet away. Lang, blinded by the flash and completely enveloped in the flames, sprang out of the cage, going through a window, carrying broken sash and glass with him. He was picked up in a heap outside a few minutes later. The foundry was filled with flying debris, while the big flask containing the casting was lifted clear out of its bed of sand and left standing on its edge.

After the explosion men came running from all parts of the foundry, while a great crowd gathered on the outside. The gas continued to burn, and an alarm of fire was sent in, as it was thought the building was on fire. There was no combustible material in the vicinity, and the flames were kept from spreading until the firemen arrived. A search began for men who were thought to be buried under the wreckage, but all but the three escaped unhurt. Warden ran into the office yelling, having been driven almost frantic by the pain. He was given medical attention promptly and later was able to go to his home. The hair is burned from his head and the skin peeled off his hands and face. White and Lang were taken to the hospital in a patrol wagon. The cause of the explosion is not known, but is thought to have been caused by gas accumulating under the big casting. The sand was torn up for several feet on each side, and everything within reach was wrecked.—Pittsburg Times.

Personal.

David Alexander has taken charge of the foundry operated by James R. Floyd & Sons at New York city.

W. J. Reardon has resigned his position as foreman of Kelly & Jones' brass foundry at Greensburg, Pa., to accept a position at Coxsackie, N. Y.

Mr. John Nevill has been appointed assistant foreman under Mr. Peter Finnegan at the large foundry of the Wheeler Engineering and Condenser Company, Carteret, N. J.

Alex. T. Drysdale, of the firm of Gardner & Drysdale, founders and machinists, New Albany, Ind., has sold his interest to S. J. Gardner, who will conduct the business in the future. Mr. Drysdale has accepted the position of draughtsman for the U. S. Cast Iron Pipe & Foundry Co., at Bessemer, Ala.

A New Iron Industry.

The Gruson Iron Works, which was incorporated under the laws of New York last May, with a capital of $500,000, has just purchased a location for a large plant at Eddystone, Pa., a short distance from Chester, on the banks of the Delaware river. This company proposes to manufacture chilled cast iron turrets, which are said to have heretofore only been made in Germany. A. E. Pearkowska, secretary of the company, is reported in the New York Journal of Commerce as having advanced the following information concerning his company and its intending field of operations.

"We shall push the construction of our plant as rapidly as possible under present conditions in the iron market, and we hope to have it in actual operation by next summer. The plant will include a large foundry, with the accompanying casting pits, and a machine shop for 'machining' the heavy pieces which we propose to manufacture. The Gruson turrets, the manufacture of which will be a special feature of our business, are made of chilled charcoal iron of the best quality; they are circular in form, with curved tops, and can be revolved by means

of interior mechanism. The sectional plates, or 'sectors,' of which they are composed, weigh from sixty to ninety tons each, and have a chilled or hardened surface two or three inches in depth. These are keyed together in such a way as to make any force acting against them evenly distributed through the whole turret. The advantage of chilled iron over steel for this purpose is that the pieces can be made of any desired shape and thickness and at less cost. A single turret weighs from 1,600 to 2,000 tons.

"The Endicott Board in 1886 proposed 22 such turrets for 16-inch coast defense guns, and while we have not as yet received any contracts from the United States government, we are confident that we will get orders. In addition to these turrets the company will manufacture other iron pieces of great size and weight.

"The capital of the company will later be increased to $2,000,000. The present capital, $500,000, is fully paid in—100 cents on the dollar. There is only one kind of stock, and no stock is for sale. The project is a strictly business one, with no fictitious capitalization.

The directors of the company are: P. H. Griffin, of P. H. Griffin Machine Works, Buffalo, N. Y.; Thomas Prosser, representative of Fried. Krupp for the United States, New York city; C. W. Barnum, of Messrs. Barnum & Richardson, Lime Rock, Conn.; T. Guilford Smith, vice-president New York Car Wheel Works, Buffalo, N. Y.; A. E. Piorkowska, representative of Fried. Krupp Grusonwerk, Madgeburg, Germany; Ernst Thalmann, Messrs. Ladenburg, Thalmann & Co., New York city; David Townsend, Philadelphia; S. Singer, Paris, France; Herbert L. Satterlee, of Messrs. Ward, Hayden & Satterlee, New York city.

Amoung the Foundries.

F. E. Wilkison will establish a foundry at Horton, Kans.

Noyes & Goddard, of Waterville, Me., are enlarging their foundry.

William Yerdon, of Fort Plain, N. Y., will erect a foundry at that place.

The Metropolitan Foundry at Brooklyn, N. Y., has been leased by T. Holleran.

The plant of the Phoenix Foundry Co. has been reopened at Chattanooga, Tenn.

John Gallispeau has decided to establish a foundry at Grand Forks, British Columbia.

The Stickney Engine Co., of Minneapolis, Minn., has had plans prepared for a foundry.

The Adams Co., Dubuque, Iowa, are building an addition to their foundry 60x113 feet.

The Stockham Manufacturing Co., of Chicago, will build a foundry in the immediate future.

The Enterprise Manufacturing Co., Columbiana, O., are erecting a new foundry, 72x100.

H. T. Merriam, of Millbury, Mass., is rebuilding his plant, destroyed by fire a short time ago.

The Midland Foundry and Machine Works Co., of Denver, Colo., will erect new works in that city.

Frank Lindsay and Frank Walsh have purchased the Lindsay & Earley Foundry at Scranton, Pa.

The J. M. Case Mill Works, of Owensboro, Ky., will build a foundry to supply the castings used by them.

The Milwaukee Brass Manufacturing Co. will erect buildings to the value of $15,000 at Milwaukee, Wis.

The Western Foundry Co., of Chicago, has begun the construction of a foundry 50x211 feet, to cost $10,000.

J. T. Shea, formerly a member of the firm of Davitt & Shea, of Springfield, Mass., has engaged in the foundry business at Brattleboro, Vt.

The Ellis Keystone Agricultural Works of Pottstown, Pa., are considering plans for the building of a foundry to supply the castings used by them.

The Utica (N. Y.) Pipe Foundry Co. will erect a new foundry building 70x150 feet, to be devoted exclusively to the manufacture of plumbers' castings.

The Carleton Foundry Co., recently organized at Hartford, Conn., have had plans prepared for a building 40 by 120 feet, with a wing 44 by 52 feet.

The Litchfield (Ill.) Foundry and Machine Co. has been organized, with a capital of $70,000, by Mark H. Martin, Patrick F. Carroll and James M. Truitt.

The Lima (Ohio) Steel Casting Co. has been incorporated with $40,000 capital stock.

by L. G. Neely, J. W. Van Dyke, D. E. Hashon and G. W. Van Dyke.

The Burton & Maas Foundry Co. has been incorporated at Chicago, with a capital of $15,000, by Harry G. Colson, Edmund S. Cummings and William R. Clasen.

The Newbury Foundry Co., whose plant at West Coxsackie, N. Y., was burned October 10, will establish new works at Goshen, N. Y., erecting a foundry 40x100 feet.

The Duquesne Steel Foundry Co. has been organized by W. A. Herron and A. W. Herron, Thomas Rodd and Edward Kneeland, of Pittsburg, and Thomas H. Bakewell, of New York.

E. M. Hodges will rebuild at once his burned foundry and machine shop at Kinston, N. C., which was valued at $5,000; new building to be of brick and fireproof construction.

John J. Goodfellow and George F. Armstrong have formed a partnership under the firm name of Armstrong & Goodfellow, and have started a general jobbing foundry at Springfield, Ohio.

The Craig-Reynolds Foundry Co., of Dayton, Ohio, has disposed of their extensive plant to the Reading Stove Works, of Reading, Pa. It is understood that the latter company intends to supply their western trade from this point. New buildings will be erected.

The Wrightsville Hardware Co., Wrightsville, Pa., has just completed $20,000 worth of improvements to their plant, and are now employing about 145 hands, and by the early spring expect to still further enlarge their plant by the addition of another foundry building capable of working twenty-five or thirty additional molders. This will increase the number of molders to eighty-five, and the company with this addition will be able to handle its large and increasing trade.

The Magnus Metal Co., Jersey City, N. J., formed recently with $1,200,000 capital stock, to take over a number of bronze and brass foundries, has absorbed the Fort Pitt Bronze Co., with plant in Allegheny City, Pa. Lang Hukill has been appointed manager for the Pittsburg district. The properties of the following concerns had already been absorbed: Hewitt Manufacturing Co., Chicago; Stiles Metal Co., New Haven, Conn.; Brady Metal Co., Jersey City, N. J., and Buffalo Brass Co., Buffalo, N. Y.

The Union Switch and Signal Co., Swissvale, Pa., will erect an addition to its plant, to cost about $250,000. The plant of the National Switch and Signal Co., Easton, Pa., recently purchased, has been dismantled and the machinery will be removed and set up in the new plant, which will besides contain a great deal of new machinery. Plans have already been prepared for the improvement, and active work will be commenced in a short time. There will be three connected structures, covering an area 400x300 feet. Iron and brass foundries will be included.

The Pressed Steel Car Co., Pittsburg, has taken possession of the car wheel plant purchased from the Pennsylvania Car Wheel Co., erected about a year ago in lower Allegheny. The Pennsylvania Casting and Machine Co., organized last August with $60,000 capital stock, is composed largely of the stockholders of the Pennsylvania Car Wheel Co., and is completing a similar plant adjoining the old plant, and will in addition make street car wheels. The capacity will be about 300 wheels a day. An increase of the capital stock to $200,000 will probably be made. The foundry department, 150x40 feet, will be completed shortly. The machine shop has been in operation for some time, machining wheels cast in the Pennsylvania Car Wheel Co. plant.

Fires.

Lykke's Foundry, Grand Island, Neb. Loss, $2,000.

Lakeside Iron Works, Muskegon, Mich. Loss, $2,500.

Stewart Heater Co., Buffalo, N. Y. Damage about $3,000.

A. E. Shorthills' foundry, Marshalltown, Iowa. Loss, $3,000.

Victor Metal and Foundry Co., East Braintree, Mass. Loss estimated at $10,000.

Philadelphia Foundrymen's Association.

At the annual meeting of the Philadelphia Foundrymen's Association the following officers were elected: President, Thomas I. Rankin; vice-president, James O. Stirling; secretary, Howard Evans; treasurer, Josiah Thompson; executive committee, Antonio C. Pessano, Stanley G. Flagg, Jr., Dr. E. E. Brown, John Glover and William Hanson.

Laboratory of The S. Obermayer Co.

As evidence that greater exactness is not only demanded of foundries, but that the foundries themselves are insisting upon certain qualities being present in the material they purchase, we herewith illustrate a corner of the laboratory of the S. Overmayer Co., at Cincinnati, Ohio.

The laboratory is not a deviation, as a certain journal termed it some time ago, but a necessity. Its present form is the result of improving and concentrating already existing facilities to meet the requirements of the day.

LABORATORY OF THE S. OBERMAYER CO.

The importance of a careful examination and analysis of the crude stock entering into the manufacture of foundry facings and the various commercial articles used in foundries were early recognized by the late Mr. Obermayer, who devoted considerable of his time to the study of chemistry, and resulted in the production of several extensively used facings. For the last ten years the chemical work of the S. Obermayer Co. has been in charge of Herman Mende, who is a graduate of the University of Jena, Germany, where he was assistant of the mineralogical and geological museum.

The principal work carried on at the Obermayer Company's laboratory is of an analytical nature, consisting of examining the crude materials, such as graphite, coke, stonecoal, clay, charcoal, anthracite, sand, flour, rosin and other things entering the foundry in various forms of manufactured articles.

Experiments on a scientific basis are continually made to improve present products and invent new ones, besides lending a helping hand to customers if they should desire a chemist's assistance.

The laboratory includes the latest and best instruments for the determination of graphite and carbon in various states. Half-shade polariscope for examination of other substances. Microscope with latest features and attachments. Mohr's balances for determining specific gravity, not to mention the rest of instruments necessary to a well equipped laboratory.

Oxide of Iron in Cupola Practice.

The effect that oxide of iron, when added in a cupola, would have upon the mixture, depends upon the amount of oxide added—upon the mixture itself—and the construction of the cupola. In ordinary cupola practice the oxide is to be avoided. When the cupola is high there may be a reducing action and some oxide reduced to iron. In this case there would be a small increase of iron, although some of the oxide may be reduced by the silicon of the iron, thus decreasing that ingredient. In the ordinary cupola the oxide is not reduced by the coke directly or indirectly. Some, perhaps, is reduced, as Prof. Turner and Gautier say in their articles on silicon in foundry practice.

Oxide of iron has a great tendency to attack, I might say, all the impurities of iron, meaning by impurities, the carbon, silicon, manganese, sulphur, phosphorus, etc. Oxide of iron plays the most important part in metallurgy in making malleable iron, wrought iron, steel, etc. In some cases oxide is added as roll scales, iron ore, etc., but in very many cases it is formed by the air oxidizing the iron. In malleable the air passes over the iron and oxidizes the iron to oxide; this oxide acts upon the ingredients of the iron; upon the silicon and manganese first, then at a higher temperature upon the carbon. In malleable wrought iron, etc., we want to reduce these ingredients, but in a cupola we do not. In a furnace we have this oxide in contact with the iron a long time; we can stir it in the iron and then let the impurities rise. In the puddling furnace this oxide, at a lower temperature, attacks the silicon and this is slagged off, thus leaving a white iron high in carbon. This action of oxide upon molten iron is about the same in the cupola if it were in contact with iron long enough. Oxide of iron has a decided effect upon the casting, as it lowers the silicon. Wanting a given per cent of silicon in the casting, the mixture must be made higher in silicon if rusty scrap is used, than if it is not rusty. To use rusty scrap in order to bring down the silicon would be bad practice, as the mixture could be made lower in silicon to start on. While in the air furnace the body of iron lies quiet and all impurities rise to the surface; in a cupola this is not the case. In a cupola the iron runs out continually, or is tapped often, and the oxide does not have a chance to separate, but mixes more or less with the iron.

Here is the main trouble with oxide. The ladle contains some oxide; it acts upon the iron in the ladle and often makes the casting on the top side of mold full of small holes; hard spots are formed, and blow holes; blow holes with often a little, round, shot-like iron at one side. The iron itself is rotten. Of course, I am presenting an extreme case, and these different signs will show up more of less, according to the amount of oxide present. In a cupola there is always more or less oxide present, and the more, the lower the silicon. To counteract this, we add in the ladle, in the wheel foundry, some ferro-manganese. Most of this manganese is slagged off, combining with the impurities.

When melting old, burnt grate bars and the like, we have a great deal of oxide of iron. The iron melts and oxide remains. This acts upon the molten iron and reduces the silicon. Oxide of iron itself is, I might say, infusible—it is a base and wants to combine with something. Silica is an acid. Hence in a case of this kind, if sand is added, the oxide forms a slag, and a more fusible slag, leaving cleaner iron. This is all there is to Mullen's silicated iron process, which made quite a stir for a while.

There is no advantage in adding sand to a grey iron mixture, unless a great deal of oxide of iron is present; then the sand helps to make a fusible slag. Silica or sand around the pig is an acid and combines with oxide of iron, limestone, etc., to form a slag. To get rid of this sand, limestone is usually added. When limestone is not used, the silica must combine with some other base, and as there is none, it must combine with the oxide of iron. Where the oxidation of the iron by the blast forms enough oxide to combine with the sand to make a fusible slag, the slag runs off without lime.

Slags are of different kinds. They are classified according to the amount of silica to the amount of base, correctly, according to the amount of oxygen in each, and each has a different melting point. Now, whenever limestone is not used, the proportion of sand going into the cupola and the oxide of iron formed by the oxidation of the blast, may be such as to form a slag which is not easily fusible and which causes the cupola to work badly; while, if more oxide of iron were present, the slag would be more fusi-

ble and cupola work better, giving better satisfaction all round. In case of this kind, rusty scrap would do good, and the foundry foreman would be led to believe that the addition of oxide was a good thing. It surely would be until the slag was fusible. It would, however, be a great deal better to see that less sand be added, and if that could not be done, it is far safer to add a little limestone. Besides, lime has a great affinity for sulphur.

While oxide of iron is the greatest substance known to purify iron of its ingredients, it must be used at the proper place and in the right way. In the cupola, it is surely out of the place for ordinary practice, and cannot be called a purifier, excepting in rare cases, as stated above, when limestone is not used and there is too much sand present.—J. C. Mears in Age of Steel.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.

Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

FOR SALE—One 3 to 4 ton jib crane, hand power. Blue print and price on application. JAMES LEFFEL & CO., Springfield, Ohio.

WANTED—Position by a competent foundry foreman. Light or heavy work. Address "Competent," Box 342, care THE FOUNDRY.

WANTED—A position as molder, to work on floor or bench, or will go in as partner. Address J. E. A., Box 345, care THE FOUNDRY.

WANTED—Position by an experienced office man; familiar with the foundry business. Address "Office Man," Box 347, care THE FOUNDRY.

WANTED—A man to take charge of the cylinder work in the foundry of a locomotive building concern. Address "L. W.," Box 343, care THE FOUNDRY.

WANTED—Cupola; 24 in. to 26 in. inside lining. Colliau or Whiting preferred. Must be in good order and cheap. Address CUPOLA, Box 341, care THE FOUNDRY.

WANTED—Position by competent foundry foreman. Nine years' experience in light and heavy work. References furnished. Address Foreman, Box 348, care THE FOUNDRY.

FOR SALE—Cupola; 84-inch diameter, hight from bed plate to top of stack 49 ft. 3 inches. For further particulars address Kansas City Car & Foundry Company, Kansas City, Kansas.

WANTED—An experienced foundry foreman, capable of directing from fifty to sixty men. A good salary will be paid to the right man. Address C. B. J., Box 349, care THE FOUNDRY.

FOR SALE—Second hand. One 63-inch Boston blower, 11-inch outlet, good as new. One 5-ton foundry screw ladle, in good working order. AMERICAN HOIST & DERRICK CO., St. Paul, Minn.

WANTED—Foundry foreman of experience and ability for shop making a specialty of Corliss and Slide Valve engines, air compressors, furnace work, heavy and light castings. Address "H.," Box 344, care THE FOUNDRY.

WANTED—A man with experience and capable of handling men to take charge of the foundry of a large manufacturing concern in Northern Ohio. State age and experience. A permanent position to the right party. Address Box 288, Akron, Ohio.

FOR SALE—Three pieces smoke stacks, 4 ft. diam., ¼ in. thick, about 10, 17 and 38 ft. lengths; also one Corliss horizontal steam engine, 12x30 cylinder, 65 H. P. Also one 18x72 in. Berryman feed water heater. Also one disk exhaust fan, 48 in. diam. All in excellent condition. Also a lot of solid and split pulleys, various sizes. Address Troy Malleable Iron Co., Troy, N. Y.

WANTED—By a manufacturing concern employing in foundry about fifteen men, a good, reliable and wideawake foreman, that is a good mechanic, understands melting iron, and knows how to handle men to advantage. Plant located in central part of Pennsylvania. Address, stating age, experience, salary expected and full particulars, "Pennsylvania," Box 346, care THE FOUNDRY.

Who are the Manufacturers?

One of our subscribers asks us, who manufactures the very light castings that are lately being used as trimmings for furniture. We will thank our readers to supply us with information on this subject.

Bronze Color of Brass Castings.—What preparation is used in brass foundries to give brass castings a bronze color? L. O.